McGraw-Hill
Publishing Company, Inc.
James H. McGraw, *President*
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American Machinist

Editors
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Volume 66 | New York, June 30, 1927 | Number 26

Requirements of Anti-Friction Bearings for High-Speed Use

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Retainer design for ball and cylindrical roller bearings—Workmanship—Mounting design features of grinding spindles, portable air-turbo grinder, and airplane superchargers—Lubrication

THE term "high speed" as applied to ball and roller bearings is, of course, only relative. What may constitute a high speed for a large bearing would be considered a low speed for a small bearing: For example, a bearing on a 4-in. shaft operating at 3,600 r.p.m. would be running at high speed although in the case of a bearing on a 1-in. shaft or smaller, a high speed would be one around 25,000 r.p.m. This article applies particularly to bearings of the smaller sizes.

The problem of operating small bearings at high speed is one that has always been of interest to the makers and users of high-speed grinding spindles. Internal grinding spindles and others of a similar type are in successful operation at speeds of 25,000 to 35,000 r.p.m. for continuous production. While claims are made that such spindles are sometimes operated at speeds up to and greater than 50,000 r.p.m., it is likely that these speeds are seldom reached due to belt slippage. Ball bearings have also been used for many years at very high speeds on portable tools of the air-turbine type for operating grinders, drills, and woodworking tools.

During the past few years another field of application has appeared, namely the use of bearings at high speed in superchargers for airplane, racing car and more recently, passenger car engines. These superchargers, which revolve at speeds up to 37,000 r.p.m., are of the centrifugal type and are used to build up pressure from the energy imparted to the air by a rapidly revolving

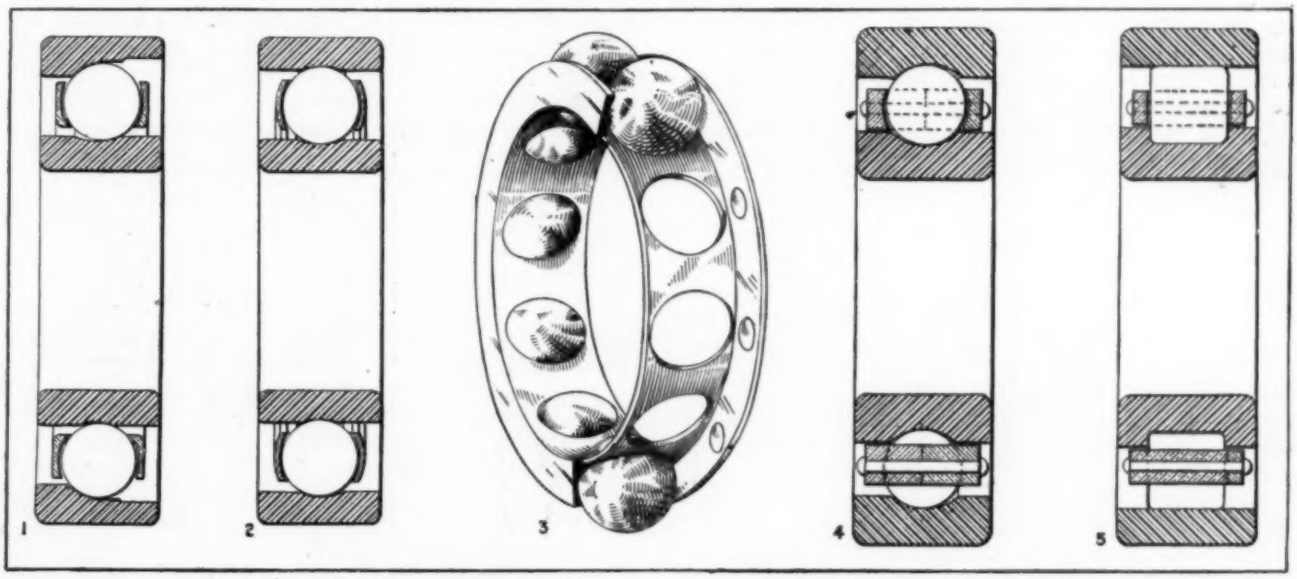


Fig. 1—Open-type of single-row ball bearing. Fig. 2—Closed or deep-groove type. Fig. 3—High-speed ball retainer for open-type bearing. Fig. 4—Retainer for closed type. Fig. 5—Roller bearing design

fan or impeller. Inasmuch as the successful operation of the supercharger depends primarily upon the service obtained from the bearings, considerable experimental work has been carried on in the past year or two to determine the most suitable type of bearing.

From the standpoint of design of high-speed bearings there are two factors to be considered: First, the design of the rings and raceways, and second, the design of the cage or retainer used to space the balls or rollers. Single-row ball bearings may be of the open or separable type as shown in Fig. 1, or they may be of the closed or non-separable type as shown in Fig. 2. In the case of the former, the bearing may be very easily separated

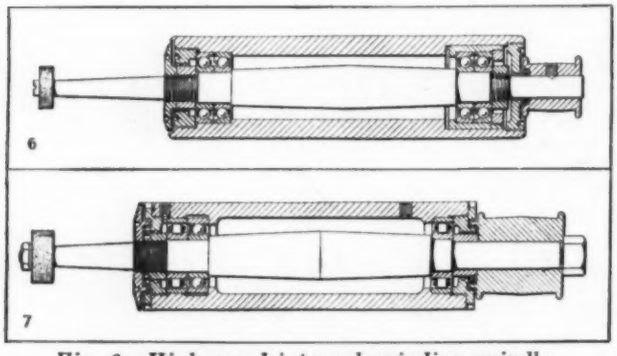


Fig. 6—High-speed internal grinding spindle
Fig. 7—Roller-bearing mounting

into its three component parts, namely, inner ring, outer ring, and cage with balls. This feature makes for more easy assembly in some cases, but more important still, the bearing may be inspected and thoroughly cleaned whenever desired. In addition to this, it permits of the use of a cage that can be made in one unit.

Closed or non-separable type bearings have the advantage that fewer parts need be handled and also that one bearing will take care of end thrust in both directions. On the other hand, they must be kept clean at all times, and in general, size for size, they contain fewer and smaller balls than open-type bearings.

For high-speed operation the cage design is of paramount importance, as cage failures are in many cases the cause of bearing troubles. Fig. 3 shows a type of cage found to be very successful at high speeds. This retainer is made for use with the open-type bearing only. It is formed of brass, is of light weight and may be carefully balanced. The openings through which the balls project to the inner ring are drilled, and each ball is yieldingly held in a pocket or recess in the flange of the cage. It will be noted that the sliding between the ball and the cage is at a minimum, inasmuch as the ball is held at the polar axis of rotation. Rubbing friction is therefore reduced to a minimum.

The usual type of retainer for closed or non-separable bearings is made up of two halves of pressed steel with pockets slightly larger than the balls. The two parts are held together by rivets. This form of retainer at very high speed frequently gives trouble; first, because of the friction between the steel balls and steel cage, and secondly, because the looseness between the cage and the balls permits of eccentric operation of the retainer if it is slightly out of balance.

A suitable design of retainer for high speed bearings of the closed type is shown in Fig. 4. This is a completely machined cage, made of extruded bronze and, of course, well balanced. It is carried upon the ground and lapped flanges of the inner ring with only a few thousandths of an inch of running clearance, and hence all looseness and vibration are eliminated.

Even though a bearing be perfectly designed, the workmanship used in its manufacture will determine its suitability for high rotative speeds. The inner and outer rings must be ground so as to have a minimum of eccentricity. Furthermore the plane of the grooves or raceways must be at right angles to the bore and must also be parallel to the faces of the rings. Otherwise the balls will not roll in a true path, and cage destruction may result. When it is remembered that a small bearing running at 30,000 r.p.m. may have eight or ten balls all revolving on their own axes at 60 to 70 thousand times per minute, it will be appreciated that any small inaccuracies will cause trouble.

The same painstaking care should be used in preparing the mountings and in actually mounting the bearings. The shafts and housings where the bearing rings are to seat themselves should be ground true and accurately to size. Shoulders on the shaft and in the housings should be turned exactly at a right angle to the axis of rotation. All other parts such as flingers, locknuts and spacers, should be properly faced off to prevent forcing the bearing rings out of their true running position. When the bearings and other parts are assembled, they should be kept clean and free from particles of grit. Also it is advisable to keep the bearings in their original wrappings or under oil until such time as they are to be assembled, in order to avoid an

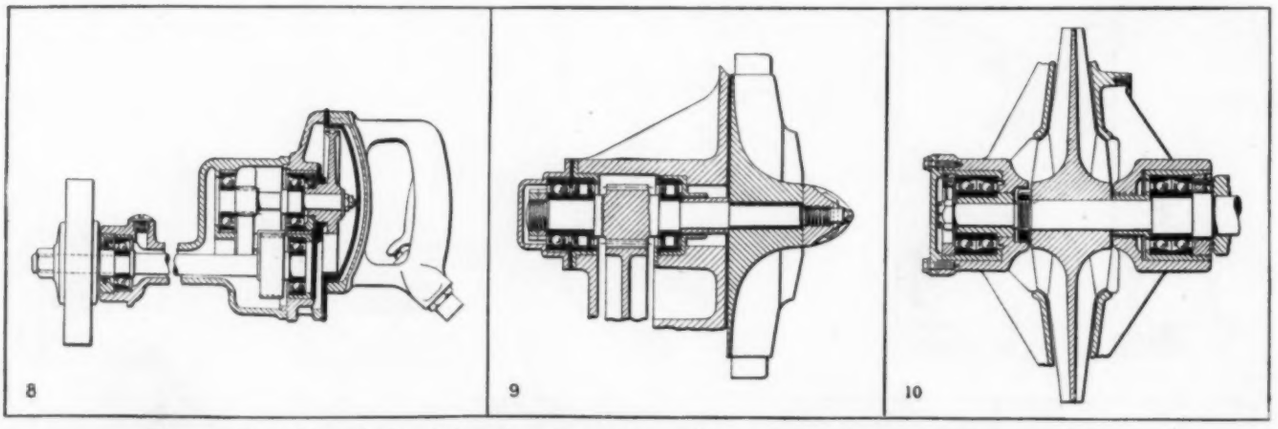


Fig. 8—Portable grinder driven by air turbine. Fig. 9—Airplane supercharger device.
Fig. 10—Turbo-exhaust type supercharger for airplane

accumulation of rust and dirt. Attention to these small details is essential if smooth and quiet running is to be obtained.

The use of roller bearings at extremely high speeds is comparatively recent, in fact roller bearings are still generally considered as being capable of operating at low speeds only. On superchargers, however, roller bearings of the type shown in Fig. 5 have been used successfully at 35,000 r.p.m. They have the advantage, of course, of providing large load-carrying capacity with light weight and small size, a very important combination in aircraft work. Roller bearings are also being used to some extent in high-speed internal grinders to carry the radial loads due to belt tension.

Precision Is Necessary

Obviously a roller bearing must be made with the same precision as a ball bearing if it is to operate at high speed. Furthermore, the same general requirements for cage design must be fulfilled. The roller retainer shown in Fig. 5 is very similar to that shown in the ball bearing in Fig. 4 except that the retainer is separated at the ends of the rollers rather than in the exact middle as in the ball bearing. The length of the roller as compared to its diameter is also important. The best proportions for high speed operation seem to be one to one; that is, the length of the roller should equal its diameter. Naturally the finish on the ends of the rollers and on the inside faces of the inner ring flanges must be of the very best in order to eliminate friction at this point.

In Fig. 6 is shown an internal grinding spindle designed to operate at a speed of 25,000 r.p.m. The mounting is one that has been used very successfully by makers of this kind of equipment for many years. Open-type bearings are mounted in pairs, those at the wheel end being locked in position in the housing or quill and those at the pulley end mounted in a bushing which in turn is free to float endwise with expansion or contraction of the spindle. When bearings are used in this manner they are carefully matched in pairs so that the faces of the inner and outer rings will be in the same plane, thereby insuring that there will be no end play when the bearings are clamped in position. The use of two bearings at each end provides greater stiffness to the spindle and helps to reduce vibration. Adequate protecting devices are, of course, necessary to prevent the entrance of grinding dust, which would have a destructive effect on the bearings.

Another type of grinding spindle is shown in Fig. 7. Precision roller bearings of the type previously discussed are used at each end of the spindle to carry the radial loads and a single-row deep-groove ball bearing is used to carry the end thrust. The housing is relieved around the outer periphery of the ball bearing so that it will carry no radial load. Under these conditions the ball bearing will develop very little endwise or axial play. A feature of this design is the rigid mounting which may be made of the outer as well as the inner rings of the bearings, thereby avoiding one source of vibration. Expansion of the spindle is, of course, taken care of in the roller bearing itself, as the rollers are free to move endwise across the face of the outer raceway.

A high-speed portable air driven grinder is illustrated in Fig. 8. The turbine of this grinder operates at a speed of approximately 25,000 r.p.m. and consists only of a carefully-balanced wheel in the outer periphery of which small pockets are milled. The air strikes these pockets at high velocity and causes the turbine wheel to reach a very high speed. In this design open-type ball bearings are mounted on the turbine shaft and accurately adjusted by means of a nut. This same type of turbine is also adaptable to high-speed drills, routers, shapers and similar tools, the desired speed of the tool being obtained by means of gear trains.

An airplane supercharger of the gear-driven type is shown in Fig. 9. Speeds of 35,000 to 37,000 r.p.m. for high-altitude flying have been reached with this type of construction. Roller bearings adjacent to the pinion carry the gear loads and a ball bearing takes care of the thrust of the impellor. Compactness of design and light weight are essential here as well as sturdy construction, so that the roller bearing is found very suitable. It will be noted that steel liners or bushings are inserted in the aluminum castings in order to prevent peening where the bearing rings are located.

A form of turbo-supercharger operated by means of a turbine inserted in the exhaust outlet from the airplane engine is illustrated in Fig. 10. Open-type ball bearings are used in pairs on this design, the form of the mounting being very similar to that shown in Fig. 6, except that both pairs of bearings are inserted in steel bushings which in turn are seated in the aluminum supports. One bushing is clamped endwise and the other allowed freedom to float with expansion and contraction of the shaft.

The lubrication of bearings operating at high speeds must be given careful consideration inasmuch as the sliding surfaces where the balls or rollers are in contact with the cage must have adequate and continuous lubrication. However, an over-abundance of lubricant will cause excessive heating due to the friction between the particles of the oil or grease when violently agitated. In fact, on airplane superchargers, bearings have been operated for short periods with only a very thin film of light oil. The usual practice in the case of grinding spindles is to put several tablespoons of oil of medium to heavy consistency in the spindle housing. When in operation the entire chamber becomes filled with a fine mist of oil which is sufficient to lubricate all surfaces.

Selection of Lubricant

The kind of lubricant to be used will depend greatly upon the construction of the machine and the operating conditions. In general, medium-bodied oil seems to be most suitable, although there are some applications requiring a non-fluid oil or light grease. Usually a little experimenting is required to determine the proper consistency of the lubricant and the quantity best suited to the application. Needless to say all lubricants used should be of the highest grade and free from any acids, alkalies or moisture which would affect the highly polished surfaces of the balls or rollers.

In the above we have endeavored to point out only those requirements that are general for all high-speed mountings. It should be remembered, however, that each individual application constitutes a problem of its own and requires particular consideration with all conditions of operation taken care of. It is suggested that such problems be submitted, with complete data, to the manufacturer of the bearings under consideration, so that specific recommendations may be made. In this way the user of the bearings may avail himself of the cumulative past experience obtained from somewhat similar applications and perhaps avoid costly experimental work before successful results are obtained.

Productive Overhead in the Johnson Shop

By John R. Godfrey

YOUNG Tom Johnson hasn't been digging into details in the Johnson Motor Co. for nothing. And he has the advantage of a fresher viewpoint than his dad. Not that the Old Man hasn't kept his eye on the ball of progress. But we are all apt to get notions that won't hold water when a real student gets on the job. That's what started the argument between them when I was in the office the other day.

"Too much overhead, Tom—that's why we don't earn bigger dividends. Now in the old days our overhead never used to run over a hundred and fifty per cent at the outside."

"Now, dad, we've argued that before. Percentages are the most deceptive things we have in the plant. And they don't mean a thing unless you know just what you're talking about—and few of us do."

"But it's way over a hundred and fifty, Tom!"

"Percentage, dad, depends on what you use as a base. And direct labor is a darn poor base in these days of machine production. It wasn't so bad when hand labor was at least half of your total cost. But it's a joke now, dad. That is, it's a joke to use it in comparing overhead with what you called overhead before."

"Son, overhead is still overhead and it's the moth that eats the hole in the woolen sock that holds the profit."

Overhead Is the Bugaboo

"Dad, that wise-crack ought to get you in vaudeville. The only trouble is that overhead is the 'bugaboo' handed down to modern business. We need some new names for things, dad. Overhead to you means nothing but wasted money. We're using the wrong terms all through the shop."

"And here's where dad gets a kindergarten lesson out of the new dictionary, eh, Godfrey"—and he winked at me.

"Well you need it, dad—I guess we all do. Take overhead and non-productive labor—they're both very misleading. I'd abolish the last—and I'd divide the first between productive overhead and burden."

"Productive overhead sounds like hot-ice to me, Tom. How come?"

"Well, take that new crankshaft lathe, dad. Cost a wad of money, didn't it? And you crabbed good and proper when I bought it. But it paid for itself in four months. That's what I call productive overhead. It has cut labor cost on crankshafts so much it's almost unbelievable. And the fact that it has cut labor cost makes your overhead, based on labor, so much more.

"That machine *is* overhead, dad, but it's worth more to us than a lot of direct, or productive labor."

"Looks like you may be right, son, in that case anyhow—but what are you going to do about it?"

"Just to keep you from having heart failure, dad, when you see overhead run over a hundred and fifty per cent, I'm going to change productive machine costs to machine-burden or productive-burden. I'm going to try and get away from the word overhead. It's a 'bugaboo' that does't mean much these days."

"But what about non-productive labor, son—where'll you put that?"

"That isn't so easy, dad. But there's a lot of it that deserves a better name, at least. Take Jimmy Stevens up in the drafting room. It's an insult to class him as non-productive just because he doesn't turn out actual product in metal. That one change he made in the design of the crankcase saved us rigging up a lot of special tools and doing several fussy operations. Saved his salary several times over, and yet we class him as a parasite—sort of a pensioner on the job."

"Sounds like there might be some sense to that, Tom my boy, but what about these office ornaments that sit around and add to the scenery?"

Productive Assistance

"That is a harder question than the other, dad—and I've done a lot of figuring about it. We've got to have someone with a smile to greet visitors. This being met with a grouchy 'what do you want,' don't add to our fame or to the business. But there's no use discussing details—yet. We've got to decide, in each case, whether we need them or not. If we need them—why aren't they part of the productive force? Isn't it just as necessary to ship motors as it is to build 'em? And if it is, why isn't the shipping clerk productive?"

"Sounds good, Tom, but it seems to me we've got too many people around. Now you go into Sam Gardner's place and you don't see anyone but the bookkeeper. Sam's got overhead down where it doesn't count at all."

"Not on the payroll, dad. But it's costing him more money every year than ours. Only difference is it doesn't show, and he kids himself into thinking it isn't there."

"I don't get you, Tom."

"Well, Sam tries to run the whole works himself, dad. He's the designer, the superintendent and chief mechanic, not to mention salesman. He tries to do so much he doesn't get much of it done right. Why, he showed me his idea of a special pump three years ago. But he was too busy to get it going and now the New Pump Co. has beat him to it. He's always behind with his deliveries—he gets a job started in the shop and then goes out on a salesman's job. When he comes back he's apt to find things balled-up, or else stopped, waiting for him to straighten them out.

Sometimes Overhead Pays

"Sam Gardner needs a darn sight more overhead than he has. He'd be money in pocket if he'd hire a good superintendent and have office force enough so that he wouldn't have to waste his time on work that ought to be done by a hundred-dollar-a-month clerk.

"No, dad—there's a lot of bunk about overhead. Some of it is the best thing we have in the plant. You're overhead yourself, dad, but we'd lose money by not having you here to advise us on a lot of things.

"The trouble is we don't discriminate between useful overhead, so-called, and the other kind. If we'd just sort it all out and see which pays and which doesn't, we'd be doing a better job than to condemn it all in a lump."

"Well! what do you know about that, John R.?" asked the Old Man. And I had to admit that Tom had a lot of good arguments on his side.

Building Electrical Machinery Without Castings

An Interview with Engineers of the General Electric Co.

By GEORGE S. BRADY
Associate Editor, American Machinist

WHAT may constitute the opening of a new era in electrical machine design, as sweeping in its effects on design as was the introduction of steel in place of iron half a century ago, is announced by the General Electric Co. in its recently adopted policy of substituting welded steel construction for iron and steel castings in the building of all of its large electrical machine units. The development work that directly led up to this announcement of policy has covered a period of several years, during which time machines have been built in regular production by fabrication and welding, and castings have been gradually eliminated. At the present time there are few heavy frame castings going into any of the large machines made by this company except on the demand of the customer, and the company engineers believe that the time is now at hand when all customers will prefer the advantages to be gained by the welded steel construction. Formerly all stator frames, rotor spiders, gear housings and bases of electric motors, generators and other units were made of cast iron or cast steel. Castings required pattern making and pattern storage, cores and founding. They then required the expenditure of much labor in cleaning and treating. Casting losses were always high in dollar value, because they were usually not determined until labor and machine time had been expended upon them. Since it is not possible to cast large thin sections, castings for such parts as frames were often heavier than actually needed. In addition to this, the gross weight of the castings was in excess of the weight required due to the allowances made for draft, risers, and gates. To add to the disadvantages of castings, restrictions were often made because of the lack of uniformity, and extra labor was often expended due to chilled scale on the castings. All of this work would add to the cost of the machine, but there is still another thing, which is the time in process. Before a casting can be started in the foundry a pattern must be made and cores must be baked. Once cast, a certain time must be allowed for seasoning and preparing the casting for machine work. If blow holes or imperfections show up on machines, the whole process must be begun again in the foundry. It has seldom been possible to work close to finished dimensions on large castings, and considerable machining has to be done. But with fabricated parts the work is held close to finished size, and light machine cuts only are required to clean up the work. Pre-machining in jigs is also found to be practical for duplicate work. Large electrical machinery units are usually "custom-made." That is, they vary in design to meet the requirements of the customer, and frequently require such alterations as to necessitate the making up of an entirely new pat-

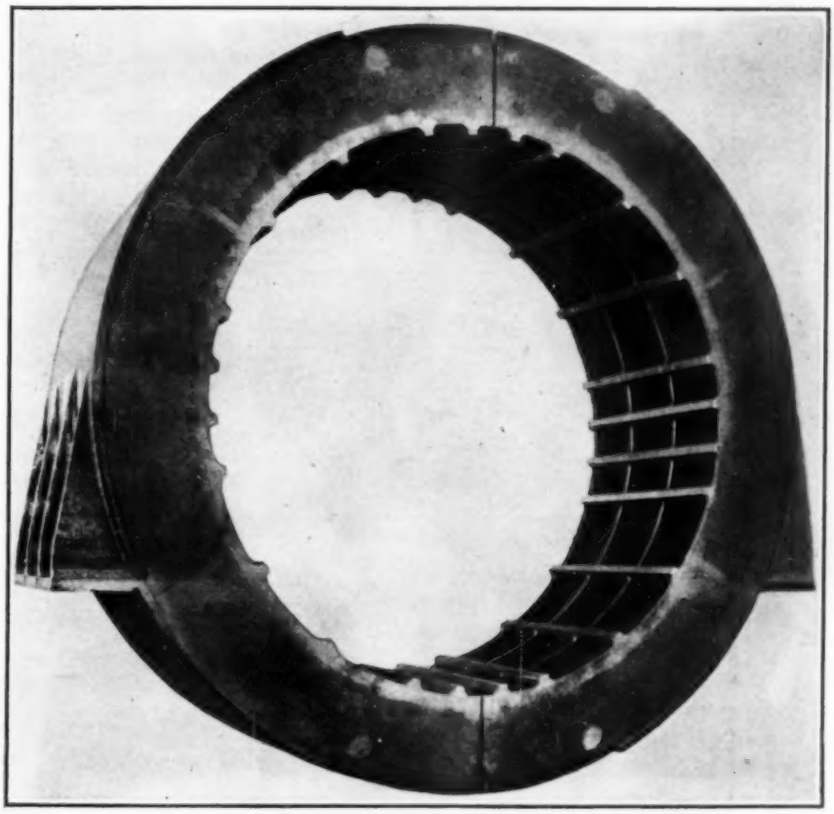
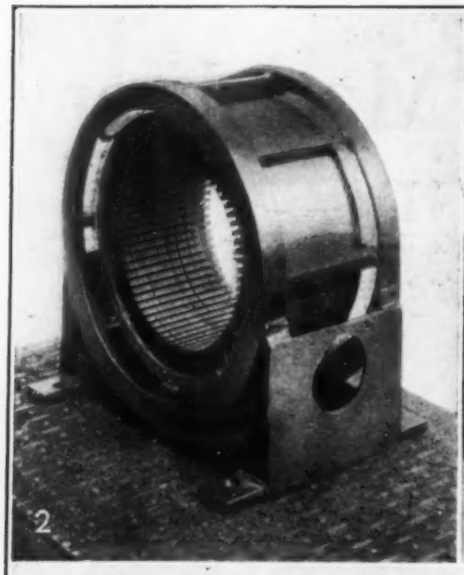


Fig. 1—A large stator frame built up by welding



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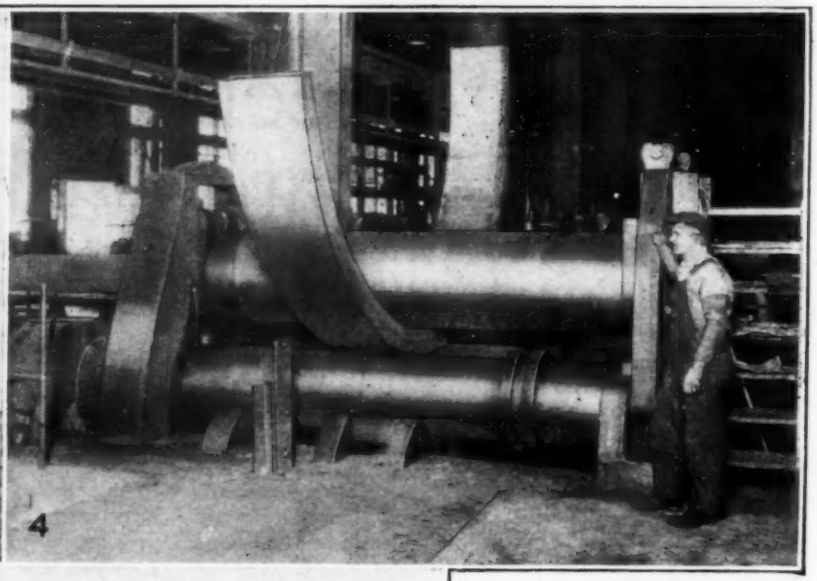

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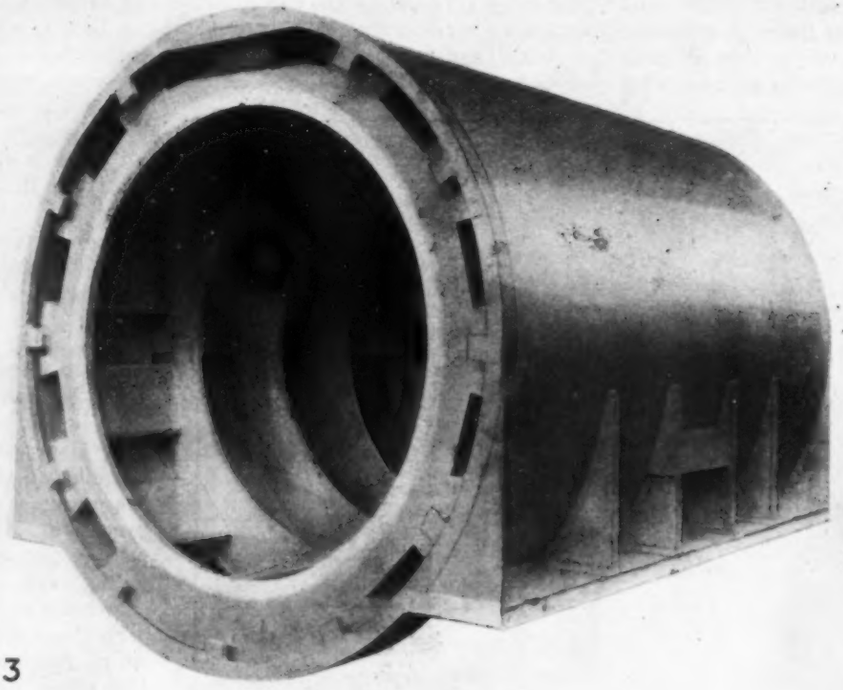

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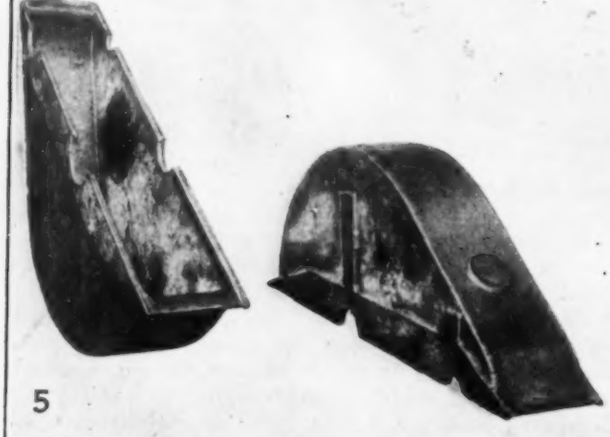
Fig. 2—The welded frame of a small induction motor showing laminations in place

Fig. 3 — Arc-welded large-capacity generator frame

Fig. 4—Shaping a steel slab to replace a cast machine frame

Fig. 5—An all-welded gear case

Fig. 6—An all-welded rotor spider used on a large alternator



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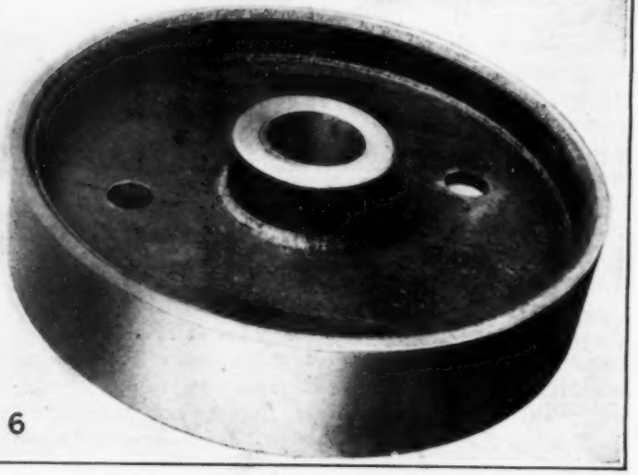

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tern. In actual process, large stator frames of welded steel have been made by the General Electric Co. in less time than it would take to make the pattern. Large saving in time, with reduction in shop space and overhead, has consequently been made.

In the change of design from casting to fabricated welded steel on direct-current motors and generators, another factor of importance balanced in favor of the welded steel construction. The heavy frames of these machines form part of the magnetic circuits, and because of the uniformity of the rolled steel and the regularity of its grain, a greater density of magnetic flux can be maintained with less copper. The frames are rolled from heavy slabs, the larger ones being made in half sections. The heavier sections for this work seldom exceed 8½ in. in thickness by 40 in. in width. No difficulty has been experienced in cutting these from plate with the gas torch. It has even been found economical to replace castings with rolled frames on motors as small as 11½ in. in diameter.

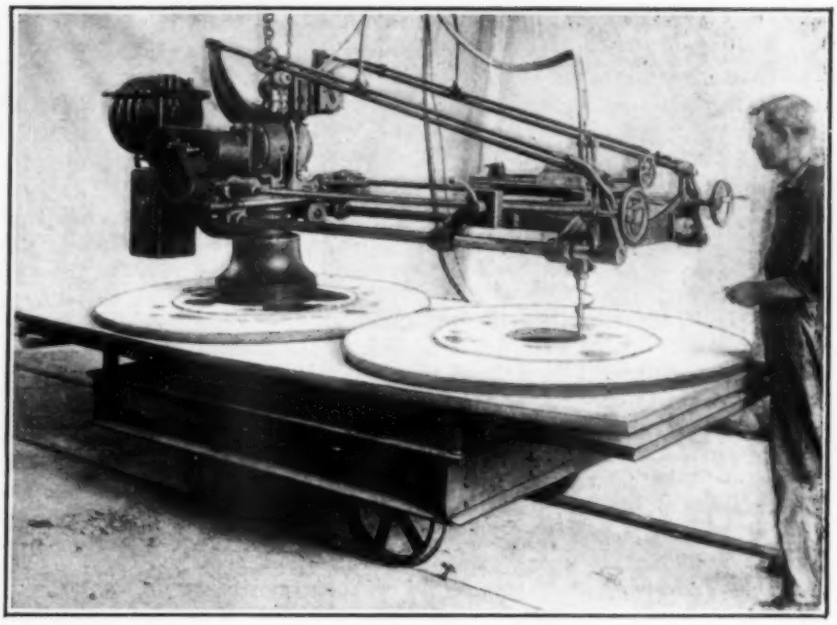


Fig. 7—Automatic machine for gas cutting of circular plates

In Figs. 1, 2, and 3, are shown typical examples of welded constructions that are actually replacing cast frames in the regular production of electrical machinery. A large capacity stator frame is illustrated in Fig. 1. In this case the circular frame was made in several parts, as it is found more economical to cut all rings above 7 ft. in diameter in segments to avoid the waste from large interior circles. In many cases, however, the circular plates cut from the interior can be used for smaller machines. The cutting of the circular plates is done on an automatic gas torch machine such as shown in Fig. 7. Larger machines than the one shown will cut segments of 20-ft. radius. Other machines of the same principle will do longitudinal cutting and from cutting to meet the requirements of the job.

The segment plates are built up horizontally from the floor, being spaced and held together by angle-iron spacers tack-welded in position. The outside plate, which has been rolled to the required diameter, is then tack-welded to the edges of the metal plate and the four sections securely welded together. The assembled frame is then brought to the automatic welding machine, and after the welding is completed the angle-iron spacers are knocked out with a hammer. In Fig. 8 is shown an automatic welder for stator frames up to 14 ft. in diameter. A larger machine with radial arm will weld frames up to 40 ft. in diameter. It is claimed that these arc-welding machines will give a uniform weld at a continuous rate, building up strong, heavy fillets. A stator frame 40 ft. in diameter and 6 ft. in width contains about 2,000 ft. of weld. The positive action of the automatic machine welding on most of the important joints gives an added security to the work as compared with hand welding. A hydrogen shielded arc is employed, and is claimed to give a ductile weld by preventing oxidation.

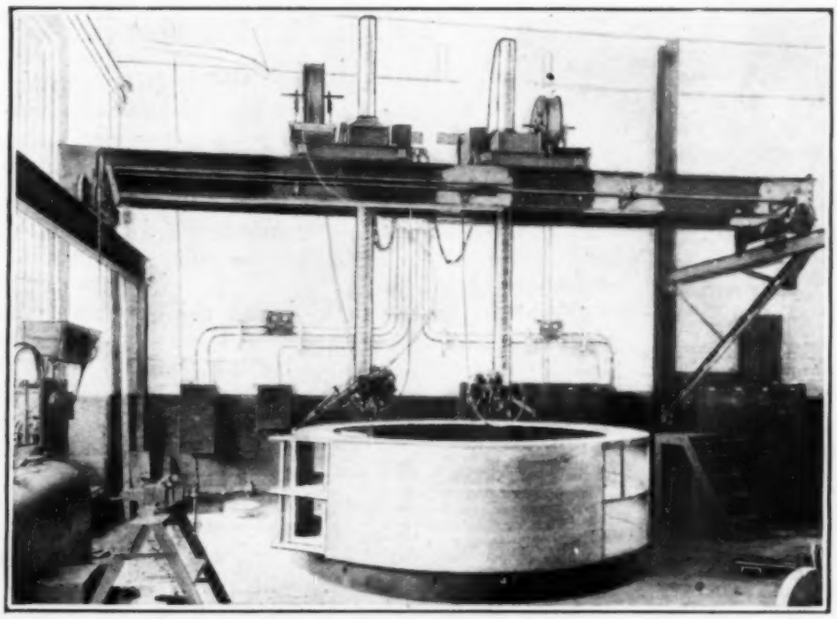


Fig. 8—Automatic arc-welding machine used for welding stator frames for large electric generators

In Fig. 2 is shown an arc-welded induction motor magnet frame. For small motors built in quantities it has been found possible to assemble and weld the parts in jigs. The stator frame shown in Fig. 3 is an example of a fabricated frame which replaces a difficult and costly casting. A large magnet frame in the process of rolling is illustrated in Fig. 4. The frame is made in half, and cut with a gas torch from steel slabs. The parts are welded together and lugs welded to the outside. Heavy bearing brackets are also built up from structural shapes and plates. In Fig. 5 and 6 are shown other parts fabricated and welded to replace castings. The first is a gear case fully arc-welded from

steel plates, and Fig. 6 shows an alternator rotor spider made entirely of steel plates welded together.

The cutting machines at the General Electric Co. are employing illuminating gas from the city supply, and are pre-heating the oxygen. This fuel, which is coke-oven gas with some water gas, is claimed to be economical, and to cut efficiently on heavy plates and slabs. Plates ½ in. in thickness are cut at a rate of 50 in. per minute, and 2-in. plates are cut at 7½ in. per minute. The cuts are clean, resembling the work done by a coarse saw, and the edges are not burned down in cutting. The exposed edges require only painting, and in the case of inside cuts fitted to pole pieces a light finishing machine cut is claimed to be sufficient. Two circles are cut at once on the machine, so that the entire circle or segment is completed in one operation. Studies are being made of the saving in weight and cost between welded-steel construction and castings, and the information already available is decidedly favorable to welded steel construction. The general average of weight reduction is about one-third, while cost comparisons show welded frames to be cheaper than cast frames.

A 15,000-kw. stator made of cast iron weighs 24,000 lb., but when entirely fabricated and welded weighs only 10,000 lb. The effect of weight reduction on the shipping and installation of large-capacity machines is apparent. Larger units can be shipped intact, and only lighter crane service is required at the power plants where installations are made. It has also been found that the danger of breakage in shipping has been eliminated.

A recent practical application of the welding methods to large machinery was in three synchronous condensers built for the Southern California Edison Co. These are the largest machines of this kind now in service, and are rated at 50,000 kva. to operate at 13,200 volts. In these machines the bearing pedestals and the base are the only large castings used. Most of the mechanical parts are of rolled steel and the stator frame is of steel plates welded together.

According to the company's engineers, the production of welded machinery at the General Electric Co. plant has been an accomplished fact for a long enough period to establish definitely its advantages. Up to the pres ent time, much of the effort has been directed toward obtaining a nearly perfect weld, but they believe as the production processes are improved less machine work will be required, and more pre-machining and jig assembling will be done on smaller duplicate machines, and that heavy machine cuts will be entirely eliminated. Large cuts in overhead are looked for in the elimination of much pattern shop, pattern storage, and foundry space. Heavy boring and planing cuts on large frames with the attendant expensive set-up are also expected to be done away with. The importance which the company is attaching to the future development of welded machine construction can be judged by the fact that all of its apprentice draftsmen are now being given the regular welder's course of instruction. This course is given in a special department, and consists of practical welding work for a period of three months. A factor not yet completely overcome is the natural caution or distrust of welding among some buyers. Extensive tests have been made, however, and company engineers are ready to place great confidence in welded constructions made by competent workmen under proper supervision.

Poor John

By Harry Senior

AT THE bottom of page 768, Vol. 66, of the *American Machinist*, a short story tells how a certain foreman stepped from under his burden of responsibility in the case of a careless (?) workman by firing the poor cuss; not because he was careless but because he carried no life insurance.

The troubles of poor John are not the subject of my present disquisition. Rather am I concerned with the modern tendency of foremen (or should I say the tendency of modern foremen?) to side-step their obligations to the men under their direction. Because John was fired, he was no more immune from sudden and violent extinction, nor was his family of five children further removed from the danger of starvation. The foreman had merely passed the buck to George; assuming George to be the name of the next foreman who hired John.

It is to be assumed that John worked for a living because he had to. Had his financial status permitted he would, doubtless, spend his life sitting in a bath tub half-full (the tub, not John) of carbolated water, which course, we are assured by certain learned medical gentlemen, is the only absolutely sure means to longevity. When he was restrained from further risking his neck on that "big grinder" under the supervision of foreman James, he in all probability was compelled by a relentless fate to continue to risk it on an equally big boring mill, planer or what-not, at the instance of foreman George.

Would it not be more in accordance with the accepted code of moral ethics for foremen in general, and foreman James in particular, to shoulder their respective burdens manfully—assume the risk of "paying the price," not of the other fellow's carelessness, but of their own urge to evade their plain duty—and teach, painstakingly if need be, the lesson of cautious, careful foresight to the men under their charge?

I strongly suspect Kendall Hereford of being a salesman for a life insurance company.

A Serial Number with a Meaning —Discussion

By W. J. Outcalt

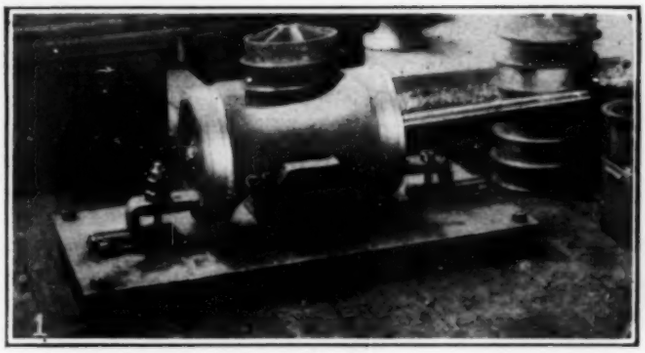
Standards Section, General Motors Corporation

IN AN article under the title given above, on page 563, Vol. 61, of the *American Machinist*, Arthur A. Merry proposes a new system for numbering machines, in which, according to his claim, the numbers will never be duplicated.

While the number indicated in the example given by Mr. Merry cannot be duplicated, there are others that can. Suppose a machine was built in January, 1922, it being the 38th machine manufactured. According to Mr. Merry's system, its number would be 12238. Again the 8th machine built in December, 1923, would also be given the same number—12238.

The owner of a machine built in 1922, if he ordered a repair part in 1924, or later, would probably get a part to fit a machine built in 1923, which might be very different from the part wanted.

I have always found a straight numerical system, free from any sort of code, to be the best practical numbering system for all purposes.



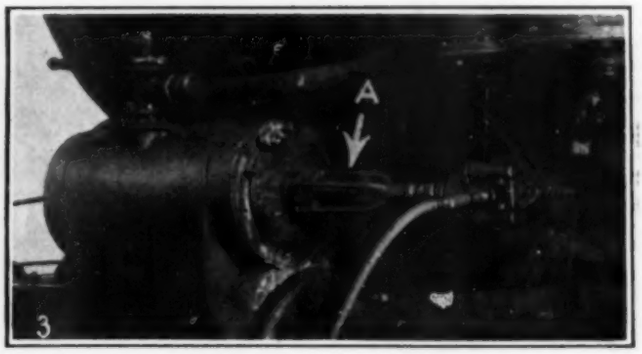


Fig. 1—Device for holding valves while drawing in followers. Fig. 3—Pulling bushings into valve chambers

Miscellaneous Work in the Lehigh Valley Shops

By S. Ashton Hand
Associate Editor, American Machinist

Pulling followers into valves—Drawing bushings into valve chambers—Cutting port grooves in valve bushings—Balancing turbine rotors and testing shafts—Straightening axles

FOR holding a piston valve while the follower is being drawn into place, the usual practice is to stand the valve on its stem and to wrap the barrel with a rope, or a chain, the ends of which are then anchored to some stationary object, thus keeping the valve from turning while the follower nut is drawn up. Such a method requires considerable preparation and is not entirely satisfactory. In doing this job at the Lehigh Valley shops at Sayre, Pa., the holding device shown in Fig. 1 is used. The valve is laid in a V-block mounted on a heavy base that is fastened to the floor by four lagscrews. Clamps are applied to the ends of the valve, as shown. It is not necessary to clamp the valve tightly as might be supposed, since any rotating movement would tend to make it climb up one side of the V-block, which movement would be strenously opposed by the clamps.

Testing turbine governors and shafts, and balancing the rotors, is done in the device shown in Fig. 2. First the shaft is laid on the knife-edge balancing ways *A* to test the static balance of the rotor. After making any corrections necessary to secure the proper balance, the shaft, mounted in its ball bearings, is placed in the uprights *B* and *C* as shown. A test for truth of the shaft is made by revolving it slowly by hand and bringing the indicator *D* into contact with it at various points in its length. If the shaft is out at one point more than at any other, it is,

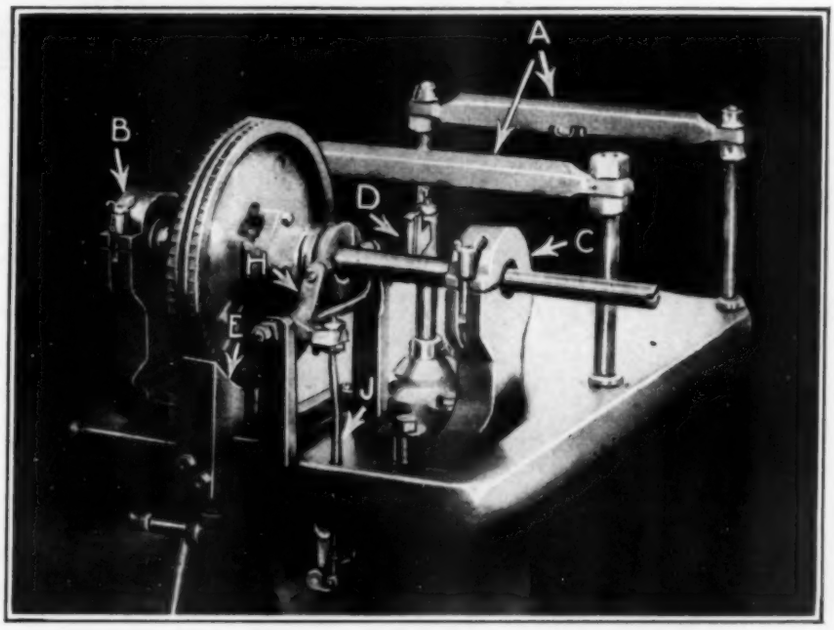


Fig. 2—Testing device for rotors and shafts of headlight turbines

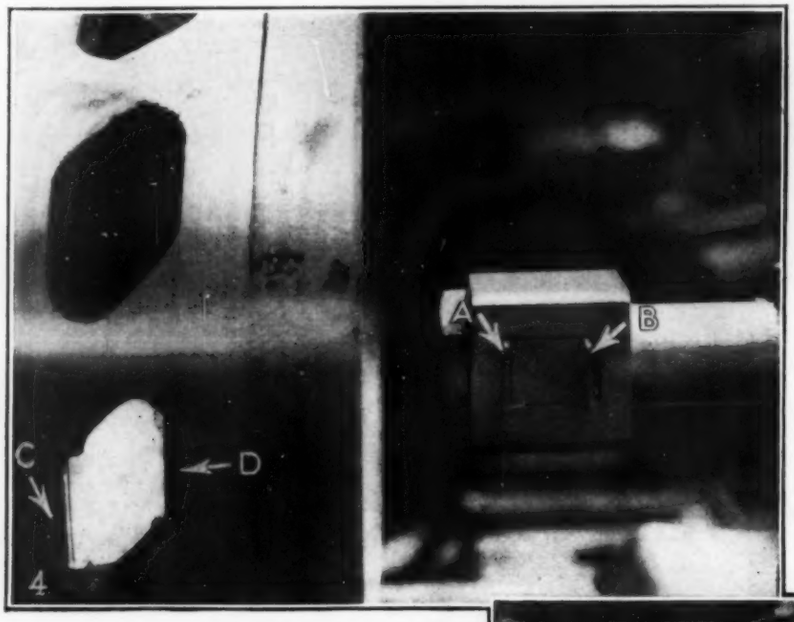


Fig. 4—Tool for grooving port openings in valve bushings. By coring the edges of the ports at an angle, with the largest parts of the openings at the outside, grooving from the inside with the tool shown will face the inner edges of the openings. By this method, milling or otherwise machining the openings is unnecessary

Fig. 5—Milling machine set up for two jobs. The fixture at the left-hand end of the table is for holding valve rings of various sizes for milling the dowel spaces. The fixture on the right is for holding valve stems for milling key slots in the ends. The end mills for both jobs are held in a vertical attachment

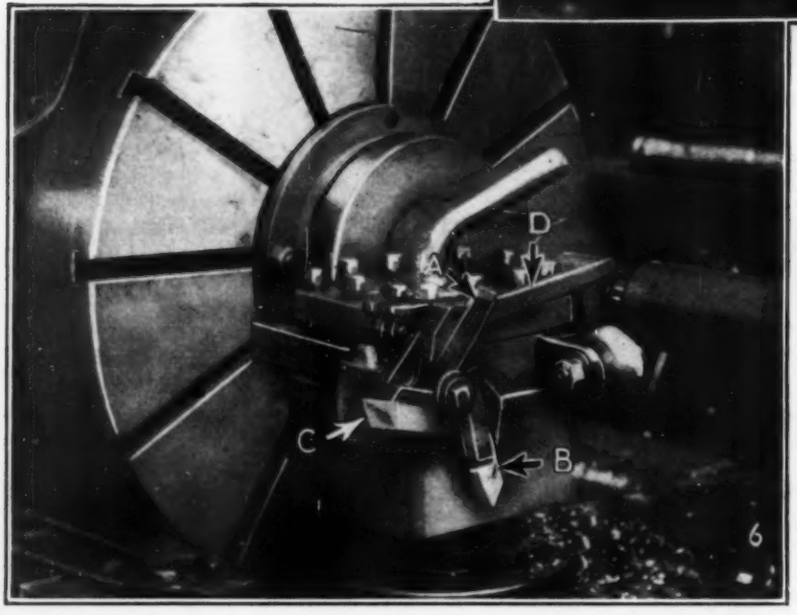


Fig. 6—An auxiliary turret. The four tools that can be held in the square turret on the carriage, are not enough for finishing crankpins. In place of one of the tools in the turret, is a shank carrying a small auxiliary turret equipped with three tools as shown. Thus six tools instead of four are available for the work.

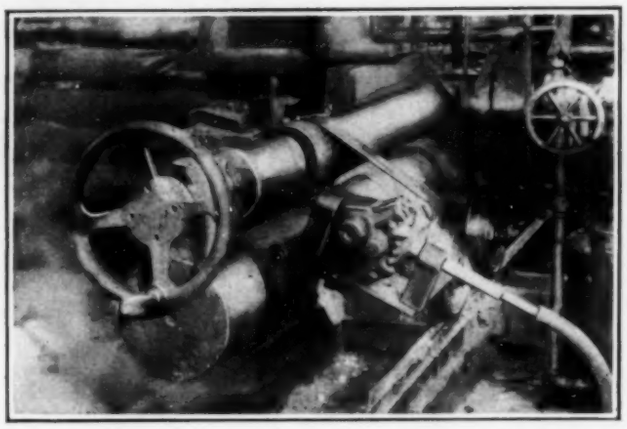


Fig. 7—Revolving an axle in a straightening press

of course, crooked and must be straightened. After the straightening has been done, if the shaft still runs out, but equally so at all points of its length, then it is straight but the ball bearings are out of true and must be renewed.

For testing the governor, the rotor is revolved by air admitted to the blades through the opening at *E*. A tachometer is used to test the speed. The governor is connected to the air valve through the bell crank *H* and the rod *J*. If the air is cut off before the rotor reaches the required speed or if the air is not cut off until after the proper speed has been exceeded, the governor needs adjusting. In Fig. 8 details of the device are shown. An air motor is used for pulling bushings into valve chambers. A cap is placed on the outer end of the bushing and another one is placed on the opposite end of the valve chamber. A long, threaded rod extending through both caps, holds the cap on the bushing by an ordinary nut. A nut bearing against a bushing at the other cap is revolved by a wrench made in the form of a yoke, as at *A*, Fig. 3. The outer end of the yoke terminates in a shank having a squared end that fits the motor shaft. With the motor running, and braced to prevent it from revolving, the turning of the nut on the threaded rod draws in the bushing. The thread on the rod extends from each end nearly to the middle, and the nut holding the cap against the bushing is braced to keep it from turning. By this means, if the nut being revolved by the motor were to turn the threaded rod, instead of turning on it, the rod would be screwed into the nut at the bushing end, and the result on the bushing would be as intended.

A device for cutting the port grooves in valve bushings to the proper width and in their proper location from the ends, is shown in Fig. 4. It consists of a bar held in a clamp on the toolblock of the lathe in which the bushing is bored, and holding two cutters *A* and *B*, so spaced as to cut a groove on each side of the ports on the inside of the bushing. Since the ports cored in the bushing are tapered, the larger part being on the outside, the grooves are cut deep enough to face the inner edges of the openings. This method saves milling or otherwise machining the edges of the ports. The port end of a bushing is shown at the left of the illustration, the outer edges of the cored openings being seen at *C* and *D*. Different sizes of spacing blocks properly space the cutting tools for various widths of port openings.

In Fig. 5 can be seen an old milling machine that is permanently set up for two different jobs. At the left-hand end of the table is a fixture for holding valve rings of various sizes while the spaces for the dowels are being milled. At the opposite end of the table is a fixture for holding valve stems for milling the key slots in the ends. In both cases the cutters are held in a vertical attachment. The cutter for the key slots is supported at its lower end by a bushing in the bracket *A*. Since both of these jobs have to be done at odd times, and often done quickly, it pays to keep this old machine set up for them, rather than to stop other work and tear down existing set-ups.

A set-up for turning crank pins is shown in Fig. 6. The four tools that can be held in the square turret are not enough for the job, so that in place of one tool is a shank carrying a small auxiliary turret equipped with the three tools *A*, *B* and *C*. The auxiliary turret is locked by the lever *D*. The number of tools available for the job is thus increased to six.

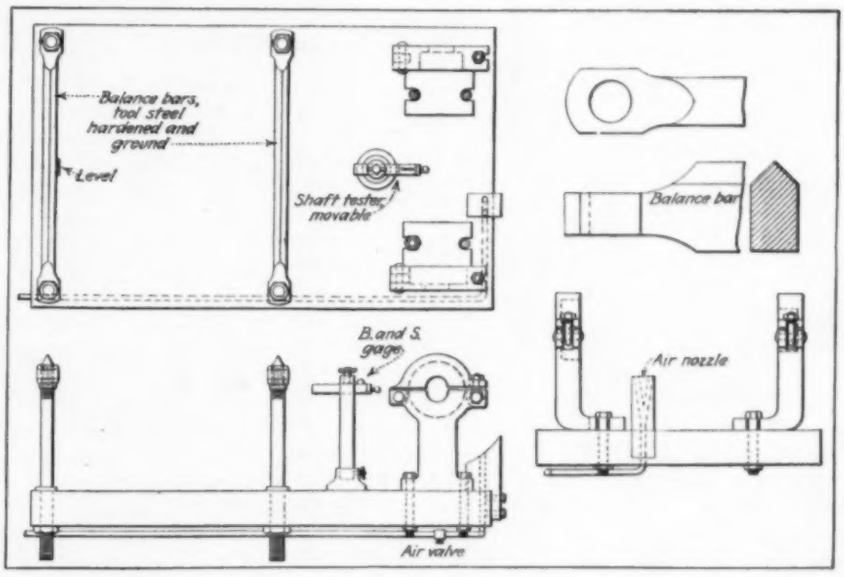


Fig. 8—Details of testing device for rotors and shafts of headlight turbines

The driver on the faceplate has three pivoted, serrated jaws, so made and hung as to grip the work when the lathe runs in the direction of the cut. The pressure due to the cut tends to tighten the grip of the jaws, and the greater the pressure the more tightly they grip the work.

Straightening car axles is done in a hydraulic straightening press. To eliminate the labor of revolving the axles while chalking the high spots, an air motor has been mounted on the machine, as shown in Fig. 7. A belt runs from a pulley on the motor shaft around the axle, thus providing means for revolving the axle by power. Since the motor revolves the axle at a much higher speed than could be done by hand, the high spots can be quickly spotted and chalked. The straightening is done in the usual manner.

Book Reviews

Foremanship Training. By Hugo Diemer. 230 pages, 5x7 in., published by McGraw-Hill Book Co., New York. Price $2.50.

After discussing the need for foremanship training in the first chapter, considering the foreman's job and his personality in the next two, the author takes up such shop problems as the production conference; foremen's clubs and associations; training in foremanship. the group leader; employee representation and numerous other topics, including the safety movement. In addition to pointing out the desirability of such clubs and associations, two chapters are devoted to typical programs to be followed, particular attention being paid to the launching of the club during the first year. There are also definite suggestions as to procedure in the years to come.

There is an excellent chapter on supplying cost information to foremen which points out just why such information should be supplied and how to best present it so that it may be readily understood and appreciated. This includes both direct and indirect labor and material, shop overhead, administrative and commercial overhead and sales expense. In too many cases such information as is made available is confined to direct labor and material, so that the foreman has but little conception of other factors in total cost.

Doing Export Business. Sixty-three pages, 6x9 in., paper cover. Published by the Foreign Commerce Department, Chamber of Commerce of the United States, Washington, D. C. Price 15 cents.

This publication is intended to supply the answer to inquiries, which come frequently from manufacturers, as to the possibilities of doing export business. Many manufacturers throughout the country, who have been marketing their products abroad for some time past, have gained information from experience that will be valuable to those just entering the export field. As export business is similar, in a general way, to domestic business; only the points of difference are treated. The mechanics of an export department and the relation between the domestic and foreign distribution departments are discussed in considerable detail. Sales management, field representation, and sales literature are covered. The intricacies of filling export orders; including proper packing and marking, invoicing, shipping, insurance, and financing are treated at some length. The closing chapter is on potential and trade markets, tariffs, and foreign taxes. This booklet will be of value to many who contemplate engaging in export trade.

Psychology of Selecting Men. By Donald A. Laird. Three hundred thirty-nine pages, 6x9 in., cloth-board cover. Published by McGraw-Hill Book Company, 370 Seventh Avenue, New York, N. Y. Price $4.

In treating his subject, the author states that the goal of employment psychology is to measure rather than to guess at the abilities of applicants for different kinds of work, to see that workers have ability for the task to which they will be assigned, and thus avoid overmanned plants as many are. That this undertaking can be accomplished with surprising accuracy is justified by the results outlined.

Psychology in the industrial cycle includes the selection of employees, management, methods of working, and advertising and selling. The book deals chiefly with the application of psychology to the first phase, that of employment. A considerable portion is devoted to the selection of candidates, the elimination of inefficient employees, placing according to ability, and detecting tempermental and personality handicaps.

The author states that character forms the foundation of most moral systems and that it may be looked upon as the hub of the business world, although there is no reason for believing that the planets have anything to do with character. An outline is given of the advantages and objectives in selecting men by letter and by personal interviews, in each case showing graphically the results obtained by actual cases.

There are stated within the volume facts that will assist the employment manager of almost any industrial or business concern, but it is natural to expect necessary modification in either direction in accordance with the personal fancy of the employing executive.

Captains in Conflict. By Robert R. Updegraff. Two hundred and eighty-five pages, 5½x8¼ in. Cloth. Published by the A. W. Shaw Co., Chicago. Price $2.

"Captains in Conflict" is a story with a hero and a villain, each of whom gets his just deserts, as heroes and villains are wont to do. It is a romance with a plot that thickens, but finally clears. To the extent indicated it follows established custom.

The characters, however, are men in business; their struggles are the business struggles of the past generation. Skillfully interwoven with the activities of the two chief characters is a history of the development of business principles and business methods since 1900. From the period of individualism existing at the opening of the story, the plot is carried through the combination, or "trust" period, into the times when the true nature of advertising, quantity production, simplification, and installment selling were discovered. There are no impossible situations in Mr. Updegraff's book, because it is a record of what has actually happened.

Take it as you will—a story, or brief business history—it is intensely interesting and deserves a wide reading by men in business.

The Mendenhall Conspiracy to Discredit English Weights and Measures. By Samuel S. Dale. This pamphlet contains the statement prepared by Samuel S. Dale and presented at the hearings before the Senate Committee on Commerce, Dec. 10, 1926. It is published in this form because the committee refused to publish any of the hearings. It will be of interest to the big majority of American business men and manufacturers who appreciate the savings made through simplification based on the present English units and dread the complications, disputes and financial losses sure to attend compulsory adoption of a different system. Mr. Dale traces the steps leading up to the Mendenhall order of 1893 which is largely responsible for the present dissensions and quotes many authorities to prove his points. His address is 11 High St., Boston.

Safety Promotion Methods Used in a Metal Stamping Shop

By P. J. EDMONDS
General Foreman, Metal Stamping Division, Westinghouse Electric & Manufacturing Co.

Keeping accident records properly—Training the new employee—Safety instruction—Inspection necessary—Providing safe working conditions—Keeping employees interested

FEW factories, if any, are entirely free from accidents. Hazards may be found in the most unsuspected places. To guard against their inroads is a difficult problem, for only by organized effort can accident prevention become really effective. Long experience has shown that the solution of this problem lies in education. Manufacturers long ago realized this and, with the aid of safety departments, accidents have been reduced materially.

Accident records to be of value should show the date and time of accident; name, check number, and department; age, sex, and nationality of the injured; severity, cause of accident, and time lost. These records should be reviewed frequently in order that steps may be taken to prevent recurrences.

Examples of such organized efforts reflect themselves in a summary of the accidents that occurred during the year of 1926 in the metal stamping department of the Westinghouse Electric and Manufacturing Co. at East Pittsburgh, Pa., where over 900 persons are employed.

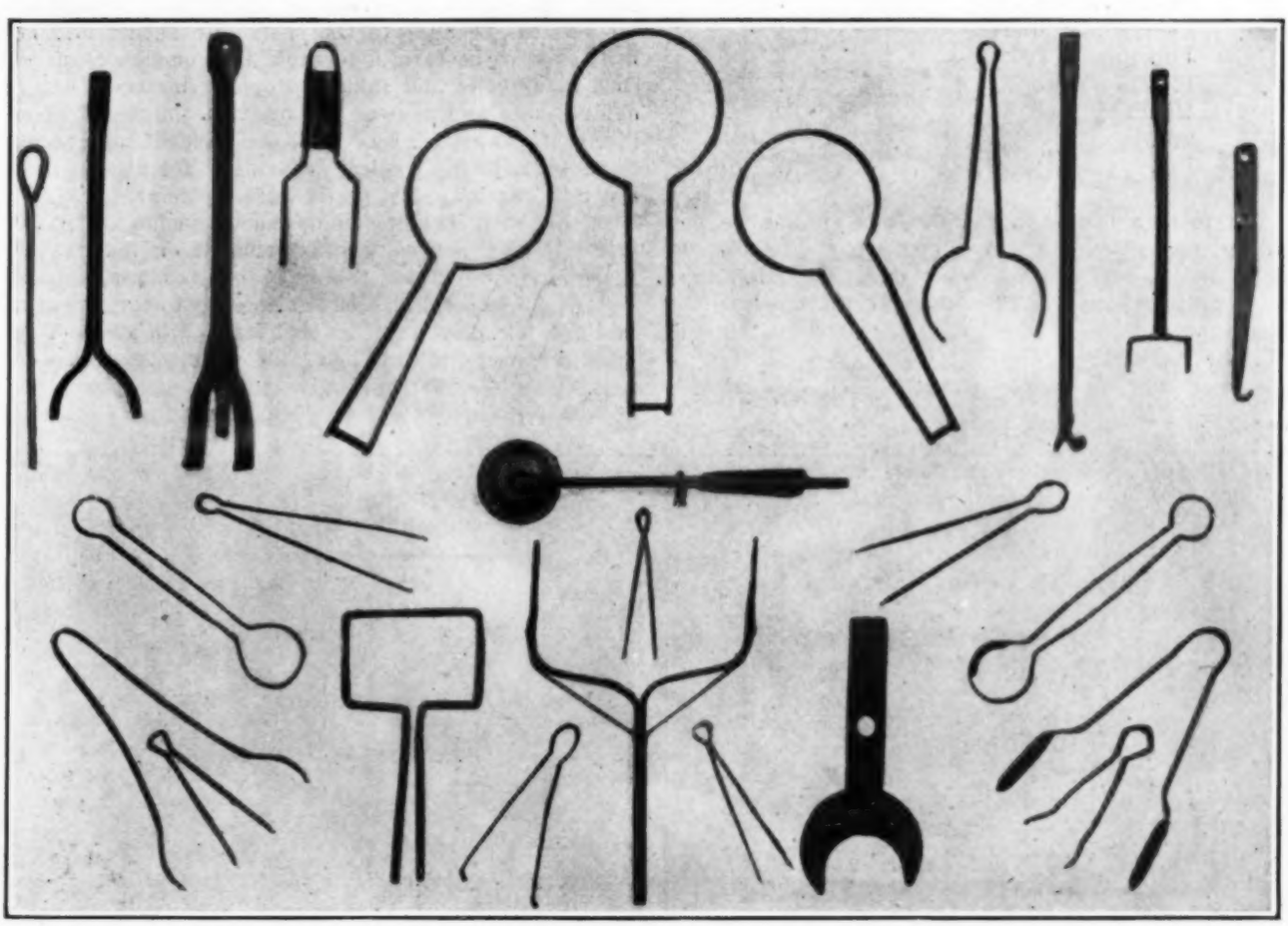


Fig. 1—Exhibiting various safety devices that make it unnecessary for the operator to place his hands in the "danger zone"

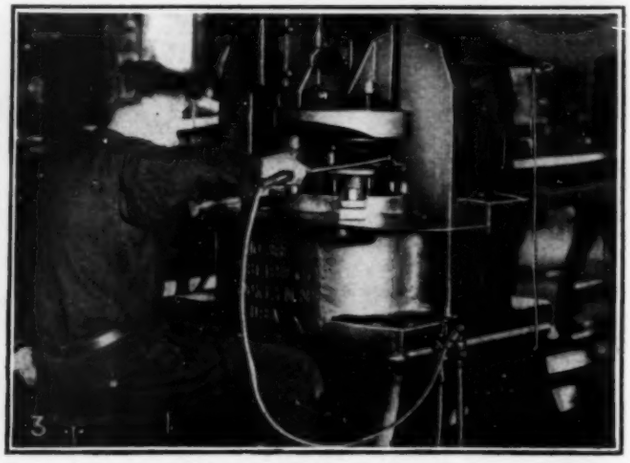


Fig. 2—Using a pair of tweezers eliminates any necessity of placing the hands in the vicinity of the punch
Fig. 3—Vacuum device used for pulling sheets between the dies

It is natural to assume that getting the hands or fingers crushed in dies would constitute the majority of accidents in a metal stamping shop. However, such is not the case, for a survey proves that the facilities now provided have been effective in reducing such injuries to a minimum.

Of a total of 36 lost time accidents for the year, an analysis showed the following:

Falling objects	13
Flying objects (eye)	4
Falling and slipping	2
Punctures	3
Handling material	2
Handling tools	1
Sprain	1
Punch press*	10

The foreign bodies in the eye and sprains do not always receive proper attention on the part of employees at the actual time of their occurrence, and often accidents of this kind are attributed by the employee to shop conditions when they may have occurred outside of the factory.

*These injuries were all caused by not using the safety devices provided.

It is recognized that the health of an employee has a definite relation to safety and that the physical and mental condition of the employee plays an important part in accident prevention. It is important, therefore, that the new employee be given a thorough medical examination. The physician's advice frequently is the means of improving the physical condition of the individual.

The teaching of safety should begin at the time the employee is hired and before he performs any actual work. He should be advised by the foreman regarding the hazards peculiar to the shop. He should also be instructed to be careful to avoid the common hazards, such as slipping and falling, dropping material, flying objects, cuts and bruises. It must be impressed upon him that, no matter how small an accident may seem, he must go to the medical department for attention in order to guard against serious developments.

In this shop statistics show that accidents are fairly evenly divided between the day and the night turn. If there is any difference, the night turn is more immune.

Safety instruction is not left entirely to the foreman and group leader. In order that safety will always be a prominent subject two men, one on day and one on night turn, spend their entire time in the promotion of safety. They patrol the shop, observing conditions

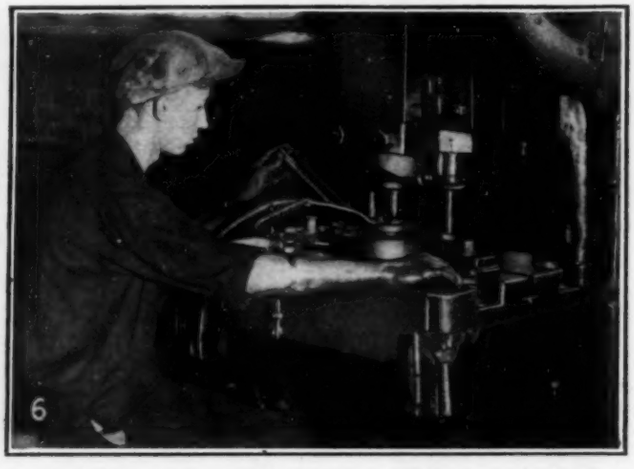


Fig. 4—Operator using a wooden stick to place work in the die and remove it at the end of the operation
Fig. 6—Die equipped with gravity feed for feeding formed work into the piercing die

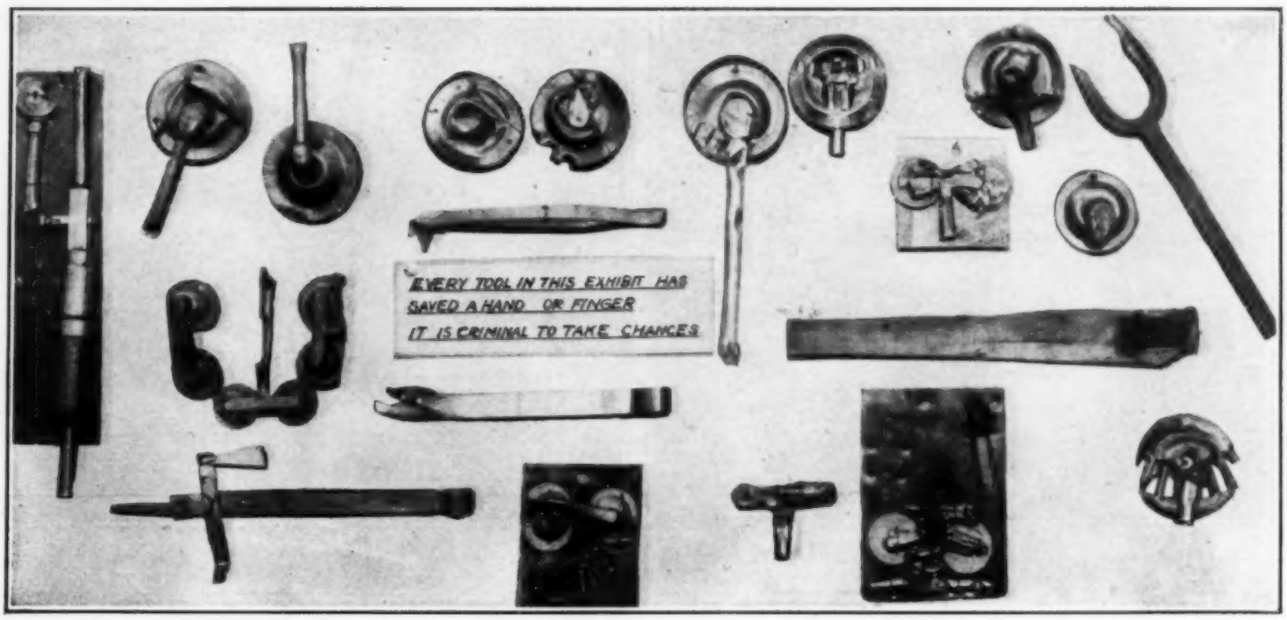


Fig. 5—Exhibits that impress the employee with the importance of always being careful

and working toward the prevention of accidents and the removal of hazards. They instruct new employees how to use safety devices, when to wear goggles, and impress upon them the importance of always using the facilities provided to make working conditions safer. They co-operate with the foremen and call their attention to any violations of the safety code.

But inspection is also necessary, not only because guards are sometimes removed or not used, but because presses require oiling and supervision in order to function properly at all times. The same is true of auxiliary apparatus, including cranes, electric trucks, and elevators.

The principal devices used in this shop for the elimination of accidents are tweezers of various types, as shown in Fig. 1, which make it unnecessary for an operator to put his hands in the vicinity of the die as the ram makes the downward stroke. They are employed for placing the work in the dies and in some cases for removing it, though for this latter, air is more frequently employed. Fig. 2 shows the use of tweezers for loading a small detail part. The piece is placed in the die with a pair of tweezers, but is ejected by air.

The handling of sheet steel in blanking operations is accomplished by the use of a vacuum device which pulls the sheets through the die as shown in Fig. 3. The vacuum device enables the operator to pick up a sheet from the load on the stand in the rear of the press and pull it forward through the die before starting the blanking operation. The suction of the vacuum device

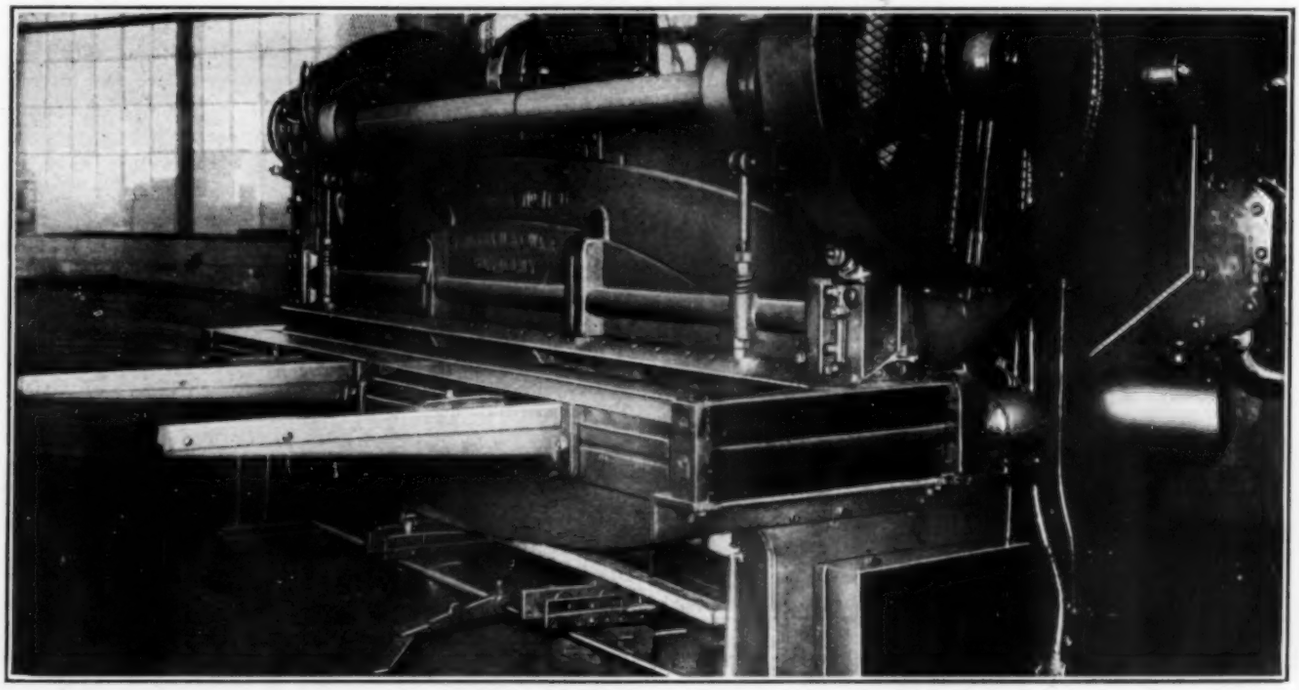
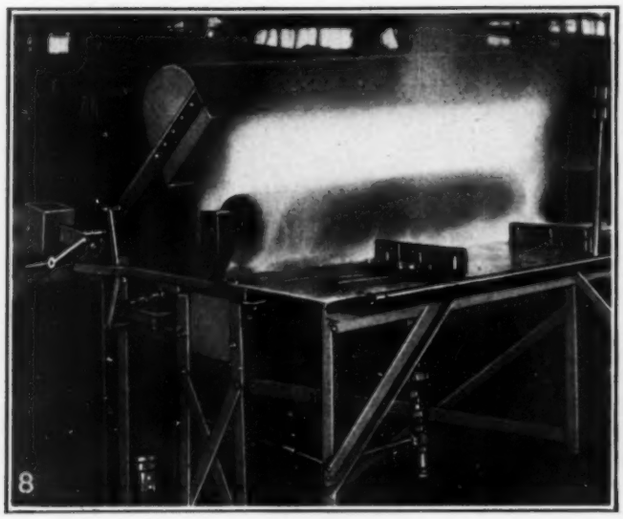


Fig. 7—Guard in front of shear blade, which has entirely eliminated accidents



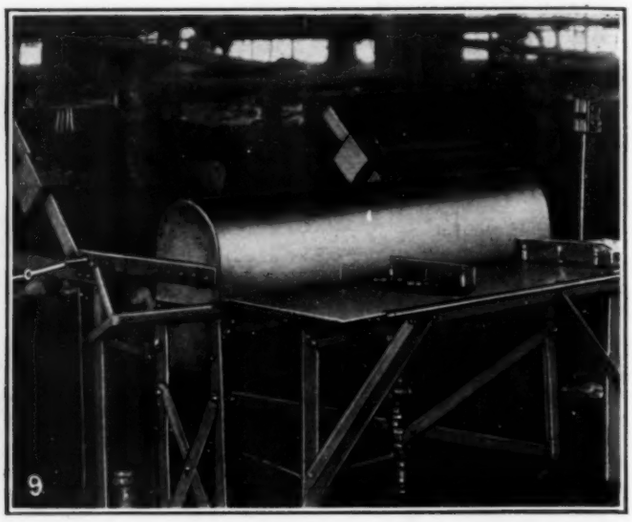


Fig. 8—Rolls in flames. Fig. 9—Flame extinguished with cover

is controlled through a valve located in the handle of the lifter.

In Fig. 4 is illustrated the use of a small stick, with a felt pad attached, in blanking laminations from circular disks. With the aid of this simple tool the operator can blank about 1,000 laminations 6 in. in diameter per hour with perfect safety, because if the press should accidentally be tripped the only damage that would be done would be a severed stick, as Fig. 5 shows at the right hand center.

In some cases dies may be equipped with gravity slides as illustrated in Fig. 6. This operation consists of piercing holes in a small detail part. The piece is allowed to slide into position by gravity and is ejected by air.

The important points to bear in mind in the selection of any safety device are: first, to select one that eliminates the likelihood of accident; and second, to select one that makes for a maximum output.

Accidents on squaring sheares due to fingers coming in contact with the hold-down bar or shear blade have been eliminated entirely, since the adoption of the guard, as seen in Fig. 7. It is impossible even to get the tips of the fingers between the table and the guard.

In enameling, fire always presents a source of danger unless means are adopted for its control. Varnish is applied to sheets by passing them between a pair of felt rolls and benzine is used as a thinner. It sometimes happens that the conveyor passing through the furnace ignites the rolls, as shown in Fig. 8. The instant this takes place the cover above the rolls, as may be seen in Fig. 9, drops down and immediately extinguishes the blaze.

Keeping employees interested in accident prevention must be continuous if accidents are to be held to a minimum. This may be accomplished by posters on bulletin boards, safety inspection committee activities, and exhibits that impress the employee with the importance of always being careful.

In Fig. 5 is an exhibit that impresses the employees with the importance of constantly exercising care in the operation of presses. The specimens consist of vacuum devices, tweezers, magnet, and the like, used in placing work in and removing it from the dies. These have all been crushed through the action of the ram when the device was in the die and are a silent reminder that "metal fingers don't bleed."

A broom is used in this shop to hold the interest of the employees, as shown in Fig. 10. For each "clean sweep month" a marker is added showing the month in which no accidents occurred. This photo was taken in 1921, which shows that the subject of safety is not a recent activity.

Daily interest is also maintained through the use of the thermometer chart shown in Fig. 11. The marker is moved upward each day until the end of the month. A tag is attached to the marker giving the number of accidents that have occurred during the month up to the day indicated. At the bottom of the board are shown the number of accidents during each of the preceding months of the year.

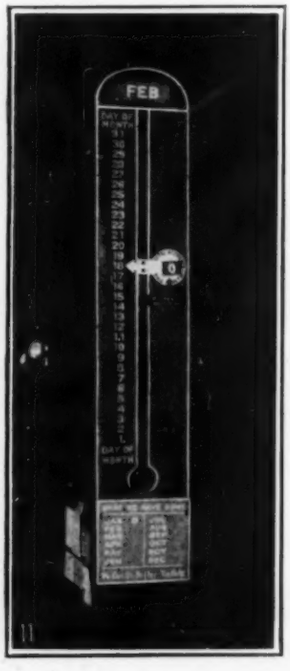
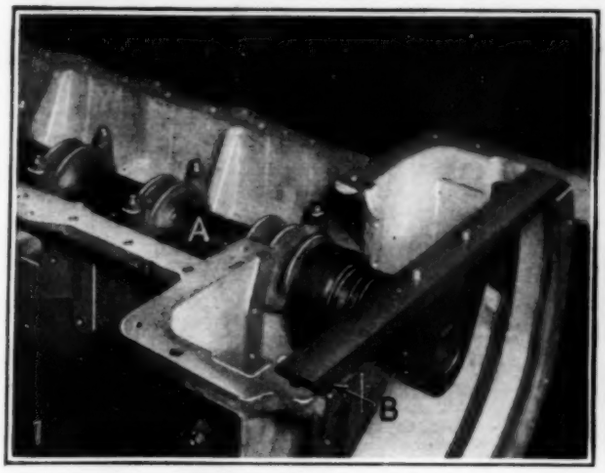


Fig. 10—Broom used to hold the interest of employees in the promotion of safety. Fig. 11—Thermometer displayed to maintain daily interest

Automotive Production



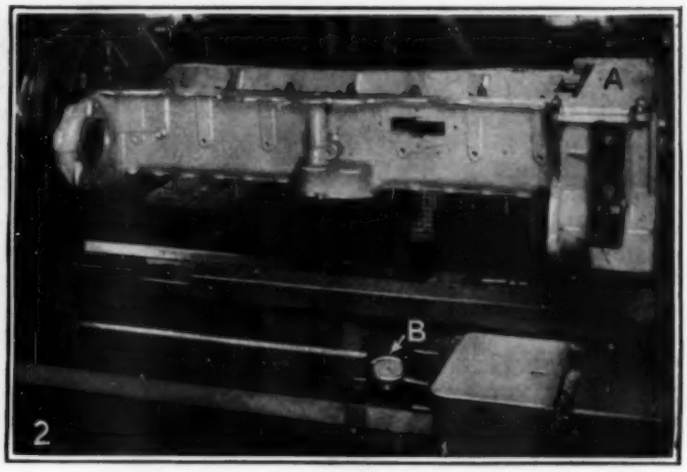


Fig. 1—Laying out the length of crankcase. Fig. 2—Crankcase in lathe; stop gage on ways

Three Unusual Production Jobs in an Auto Shop

By Fred H. Colvin
Editor, American Machinist

A special mandrel for scribing and facing crankcases—Methods used in assembling the valve-operating mechanism—Oil pumps tested under working conditions

SQUARENESS of the crankcase is an important item in engine performance and in the alignment of the transmission. The method used in the Franklin shop to insure the bell housing being in line with the crankshaft is of interest. In order to secure the desired alignment the crankcase is mounted on a special mandrel as in Figs. 1 and 2.

The mandrel, shown in detail in Fig. 3, is hollow and has hardened plug centers forced in each end. The mandrel is tapered on the outside, the center portion being a trifle smaller than the diameter of the center bearing. Split bushings are used on each end, the taper being sufficient to expand them into contact with the end bearings, on which the case is supported. One of these bushings is shown at *A*. The marking or scribing plate is shown at *B* and the mandrel itself at *C*, which includes the spring take-up.

The transmission end of the case is faced with regard to the front bearing, at the other end. To do this a collar is slipped over the end of the bar and seats against the front bearing, thus placing the bar *A*, Fig. 1, at the proper location for scribing the end as at *B*. This line is scribed before the case is put in the lathe. The scribing plate is then removed, and the plate A, Fig. 2, is bolted in place so as to support the case against any distortion. The case is driven by the special chuck to be seen at the opposite end. With the crankcase mounted in the lathe, the facing is done in

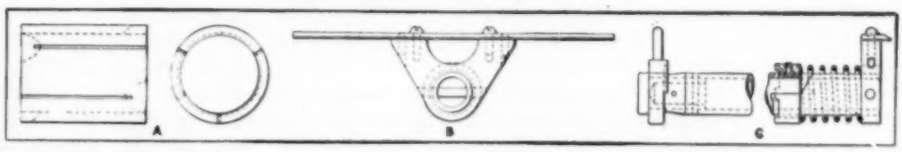


Fig. 3—Details of the mandrel, including the spring take-up, one of the bushings and the scribing plate

Automotive Production

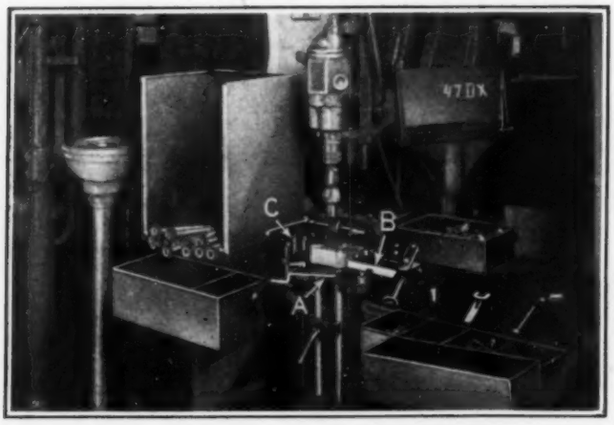


Fig. 4—Assembling valve mechanism

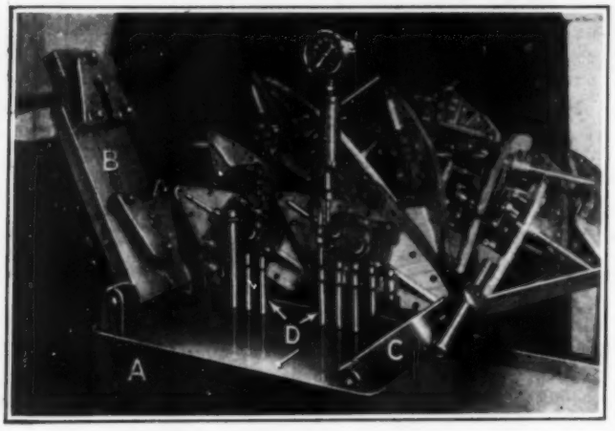


Fig. 5—Testing the oil pumps

the usual manner by a tool in the cross-slide of the carriage. The dial indicator *B* is set by moving the tool to the scribed mark on the case. Several cuts are necessary. In taking the finishing cut, it is necessary only to move the carriage up until the gage is at zero, when the tool will be in its proper position to secure the desired length of crankcase.

The assembling of the valve-operating mechanism is done with specially designed clamps and a Brown electric nut-driver as in Fig. 4. The valve-rod tubes are clamped at *A*, while clamp *B* holds the case that contains the valve arms or walking beams. The nuts are placed on the studs *C* at the left, and are picked up by the driver and screwed home at high speed. One man turns out these unit assemblies very rapidly.

Testing the oil pumps before assembly to the crankcase is shown in Fig. 5. The oil in the tank at *A* just covers the plate representing the crankcase surface that receives the pump. The pump is mounted on the test plate as shown, the pump and plate being placed on the tank support. Then the arm *B* is swung down so that the plate is clamped by the six points shown. The clamp *C* swings over the end of *B* and fastens the pump and plate securely in place.

Each of the upright pipes at *D* represent an oil lead, and each has a small hole on the tank side. When the pump is in place with its shaft meshed into the driving gear, the motor is started and the pump goes to work.

When Taps and Dies Were Young

By Ellsworth Sheldon

THE die-plate and taps shown in the illustrations are at least 125 years old and may be much older. They were found in an old blacksmith shop that had been standing since pre-revolutionary days upon land that is very nearly opposite to the present site of Winter Bros.' factory in Wrentham, Mass., and were given to Mr. Winter many years ago by the last of the line of blacksmiths who conducted the shop.

It is fairly evident that the tools were intended to be used in sequence, for though they are all of the same

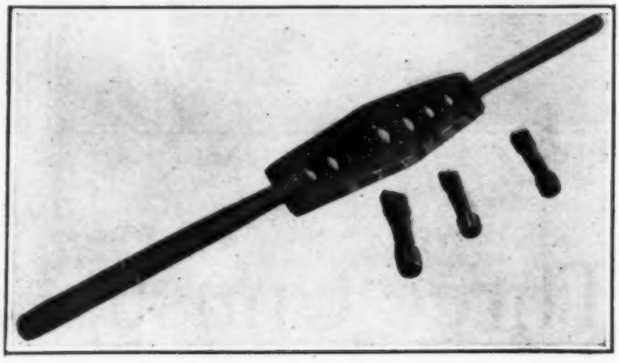


Fig. 1—Die-plate and taps

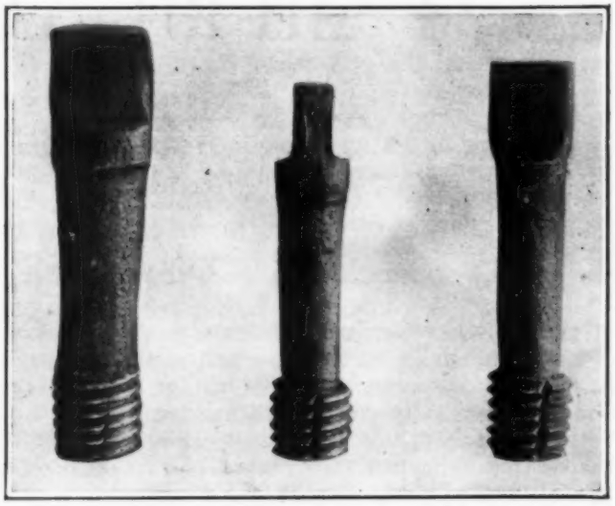


Fig. 2—A close-up of the taps

pitch, they vary progressively in diameter. The largest tap is about ⅜ in. in diameter and the smallest ¼ inch.

The die-plate is about 10 in. long, with round handles welded or forged at the ends, making a total length of 30 in. There are seven openings, increasing in size and marked by Roman numerals filed on the chamfered corner of the plate. At one end of the plate the first hole, which may be assumed to be No. 1, is not numbered. From thence the numbers are, respectively, III, V, VII, VI, IIII and II. The fact that the No. 4 opening is marked IIII instead of IV is itself suggestive of antiquity.

Automotive Production

Fig. 1—Forming the strips in the press

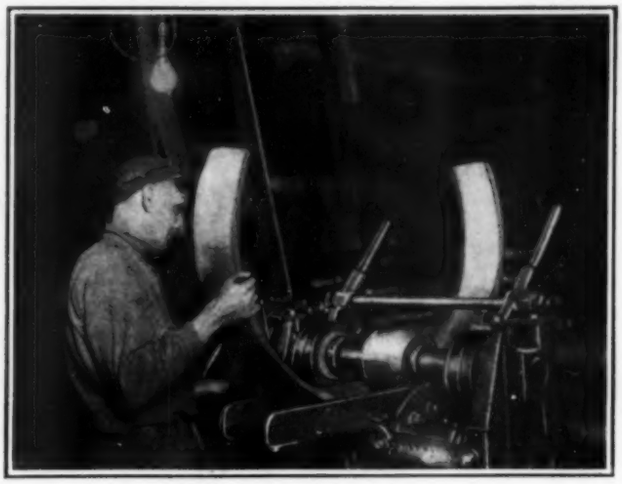


Fig. 2—Curving the guards to radius

Forming Mud Guards for Motorcycles

AN IMPORTANT, though unobtrusive, feature of a motorcycle is the guard that partly covers each road wheel to keep the rider from being plastered with mud or drenched with water whenever he chooses or is obliged to ride out in stormy weather. The series of simple operations employed by the Indian Motorcycle Co. to make these indispensable parts is here described.

Several lengths, of different radii, are required by this company for the line of machines it manufactures. All of them are made in the tools and machines here shown; the difference involving the setting of a few gages and making adjustments of the rolls, which can be done while the machine is running.

Sheet stock is cut up on power shears to the required lengths and widths for all sizes, and these pieces are carried in stock so that when a shop order comes through for a definite number of a certain type of guard the operator has only to requisition the stock room for the number and kind of pieces necessary to fill it.

The first operation is performed in the large back-geared press shown in Fig. 1 by laying one of the flat strips on the die as here shown, where it is located widthwise by gages, or set-edges, that are secured by screws to the top of the die-block. In the bottom of the curved portion of the die there is a row of spring-supported plungers the tops of which project to about the level of the strip as it lies on the die.

One stroke of the press pushes the flat strip of metal into the die, forcing down the spring plungers and forming the strip to the shape that may be seen in this illustration. As the punch rises from the die the spring plungers push up the piece to follow it until at the completion of the stroke it occupies its previous position above the die.

Adjacent to the forming press is a machine, shown in Fig. 2, with a pair of rolls that are shaped to conform to the contour of the guard as it comes from the press. A curved apron, also shaped to match the formed piece, guides the work into the rolls. Both rolls are positively driven, and the lower one is supported in bearings the position of which in relation to the upper roll and apron can be changed by the movement of a lever within easy reach of the operator.

Several passes through the rolls are required to curve the guards to the desired radius, and these passes may be made successively, or, as is the usual custom, the full number of pieces is run through before altering the adjustment of the lower roll. A helper is stationed back of the machine in the latter case to take out the partly curved pieces and stack them, ready for the next pass.

As shown in the illustration the operator is handling the machine alone, and there are two guards to be seen; one having just left the rolls and the other on just entering for the (in this case) third pass. As the piece nearest him is gripped between the rolls the operator will reach over the machine for the other one, and, with his hand on the adjusting lever, wait until the first one has passed through. He will then pull the lever forward one notch on its quadrant and enter the first piece for its fourth pass.

If but two guards are needed, one man can handle the machine as well as two, as he does not have to lay down one piece and pick up another; both are in the machine or in his hands all the time.

THE · FOREMAN'S · ROUND · TABLE

Conclusions from the Round Table

The foreman discusses his own problems—A summary of the views of 200 practical men who have discussed the problems presented by Al and Ed during the past year

IT IS just a year since the "American Machinist" began to publish the practical letters from foremen, setting forth their views on the answers to problems that come up in the daily work of machine shop foremen. Forty-nine problems were presented, and answers were published from more than 200 men from almost every state in the Union, from Canada, and from five European countries. The discussions from the practical men offer a good cross-section of the attitude of the shop toward these common problems, and a summary is here presented of the majority opinion and statements on the subject. Not every answer is given, but those that have appeared to be the preponderating opinions are tabulated.

How Should Suggestions Be Handled?

1—A suggestion plan with reward is good for the shop.
2—Useful suggestions should be paid for.
3—The foremen should pass suggestions along.
4—If men make suggestions directly to higher ups, the foreman should be present.
5—A suggestion committee might well be made up of foremen and a man from the engineering department.
6—Every suggestion should be courteously acknowledged.

How Much Standby Equipment Is Necessary?

1—Every machine shop should have some reserve capacity based on the experience of the shop.
2—A small reserve equipment is not expensive.
3—Standby equipment may vary from 5 to 20 per cent.
4—A good machine inspection and repair system will cut down the amount of necessary standby equipment.

Where Shall We Start Apprentices?

1—Work should be graded from simple to more difficult.
2—Start the apprentice in the shop, not in the assembling room, but show him the machine where the parts go.
3—Rudiments can best be taught in a separate training department.
4—The repair department is a good place to start boys.
5—The assembling room is a favored place to start an apprentice in many shops, because they believe it gets the boy interested, and gives him a broader view of the work.

Letting a Man Try His Own Way

1—The foreman should lay out work and be an advisor.
2—But he should not feel hurt if he must accept suggestions from the men.
3—Discipline in the shop does not mean machine-like obedience to orders.
4—A good foreman will give the able workman much free rein.

Keeping Machines on the Job

1—Foremen should teach men to report needed repairs.
2—To understand when it pays to repair or scrap a machine, a foreman should have some idea of shop economics and costs.
3—Machines in the production shop should not be unnecessarily burdened with repair jobs.

All foremen are urged to discuss these questions. Acceptable letters will be paid for. Next topic: Keeping down the work in process

Picking Assistants

1—Understudies should always be provided.
2—Records that are used as personnel guides are too important to leave to minor clerks to keep carelessly.
3—There should always be men in the department who can keep things running while the foreman is away.
4—A foreman is not ready for a higher position until he has trained men and outgrown his job.
5—The foreman should pick his assistants from his own men.

Assigning Work to Machines

1—The success of a system of planning depends on how it is sold to the men.
2—A system that relieves the foreman of routine is best.
3—The foreman is often in a better position to judge the machines for the job than the planning department, and his co-operation is necessary.

Just What Is Discipline?

1—Rules should not be made merely to protect executives in case of error.
2—Rules should be enforced on all equally.
3—A rule that cannot be enforced should be recalled.
4—A booklet of rules should be given each new employee.

Getting Information from Catalogs

1—Catalogs are apt to cater too much to the higher ups.
2—The shopmen want operating and servicing information.
3—They also want replacement part lists.
4—The catalog can well be a textbook on the machines.
5—The foreman is consulted when new machines are bought.
6—The machine builder should see that the foreman is handed the best information on the machines.

Teamwork in the Shop

1—Foremen should help each other over difficult jobs.
2—The foreman of one department must not lose sight of the organization as a whole.
3—All-around co-operation is as necessary in the shop as on a football team.
4—No department can pull alone.

Who Should Boss the Move Men?

1—In highly organized production shops, the move men may be under the planning board operators.
2—All move men should be under one separate foreman.
3—Where each foreman has move men, the overlapping and unloaded trips are wasteful.
4—Where trucking is under one department, electric trucks and other features can be used to best advantage.

Saving a Man's Face

1—Avoid hurting a workman's feelings.
2—Usually a man needs only to have his defects called to his attention.
3—Ridicule leaves the workman sullen and resentful.
4—Men who cannot be driven may be led by kindly treatment.
5—A foreman does not "cuss" the machine when it breaks down.
6—The foreman should study his men, find the causes of their troubles and lead them on the right track.

The Foreman's Main Job

1—The foreman should take an interest in the cost of jobs.
2—The ideal of the foreman should be to have all work done in the smallest possible time, with the smallest possible cost of material.
3—Everyone should think about cost.
4—The foreman can get more speeding up by making his men consider cost than by going about preaching speed.

Keeping Men Interested in the Job

1—Men are not interested in things they know nothing about.
2—If a man is told where the part fits and where the machine goes, he is likely to do a better job.
3—The factory newspaper, printed twice a month, has been successful in developing interest in the work.

Who Should Keep Machines Oiled?

1—Apprentice boys make unreliable oilers.
2—Piece-work operators forget to oil the machines.
3—There should be a man responsible for all oiling.
4—Proper oiling requires specialists on lubrication.
5—A bonus paid on the basis of no breakdowns would assure better attention on the part of the oiler.
6—Self-oiling bearings will help lubricating conditions.

Personal Appearance in the Shop

1—Men who keep themselves and their tools clean do the best work.
2—Cleanliness does not mean dodging the messy job.
3—Clean clothes and clean thoughts influence the community in favor of the firm.
4—Apprentice boys acquire slovenly habits easily.
5—The foreman can impress the boy in a casual way on matters of personal appearance.
6—The foreman should set a good example in personal appearance.

Should Foremen Be Good Actors?

1—The foreman should act natural.
2—Creating an impression is likely to set up antagonism.
3—A proper authoritative manner can be cultivated.
4—Correct speaking is appreciated in the foreman.
5—The "hat-over-one-ear" foreman is below the standard now required by the management and by the men.
6—Sincerity in the foreman will meet with the sympathy of the men.
7—Sarcasm and crude joking should not be indulged in by the foreman.

Getting Men to Observe Safety Rules

1—The foremen must insist that safety rules be obeyed.
2—The safety department must co-operate with the foremen to obtain wise rules.
3—Serious infraction of rules is a cause for dismissal.
4—It is up to the foreman to insist on safety appliances in his department.
5—Lectures to the men on safety by competent authorities are beneficial.

Making Good Workmen Out of Poor Prospects

1—The goodwill of the workman is as necessary as the goodwill of the customer.
2—It pays to try to develop the men whose personality is against them, but who are earnest.
3—The foreman can well be a student of human nature.
4—A voluntary pay increase once in a while will build up the morale of all of the workmen.

Cutting Down Unnecessary Repair Costs

1—A bonus penalty should help to keep down damage to machines through carelessness.

Cutting Down Spoiled Work

1—Periodic inspection of gages and thorough inspection of the first units will cut down spoiled work.
2—Inspectors must not become post-mortem tribunals.
3—The inspectors' sole duty is not merely to find spoiled work.
4—An exhibition of spoiled work in the shop will do good, but labeling it with the workman's name would cause bad feelings.
5—One firm posts weekly in each department a statement of the cost of spoiled work for the previous week.

More About Discipline in the Shop

1—Temporary demotion is more likely to kill than cure.
2—If the foreman cannot appeal to the man's better nature, the chances of success by ridicule or humiliation are small.
3—Punishing a man by putting him on boys' work will disrupt discipline.
4—Broken-spirited men are a discredit to a foreman.

Why They Decided Not to Use a Jig

1—Jigs almost always save time on production work.
2—Jigs avoid trouble with spoiled work.
3—Center punch marks are guides only, and will not prevent a drill from running out. A simple jig will prevent errors and also be ready for repeat orders.

Should Foremen Accept Presents from Their Men?

1—Subscriptions from the men in the shop are bad, because the men feel that they will be in wrong by not subscribing.
2—A foreman should not accept presents, except possibly when he is leaving to go to another job.
3—A letter of appreciation from the men when the foreman is leaving is worth more than a present.

Which Kind of Man is More Valuable?

1—The man who can be depended upon to report things that are wrong is a valuable man.
2—Running to the foreman with every little thing can become a nuisance, but meeting such a situation depends on the foreman.
3—The man who hunts up the foreman is often only trying to stand in, but a foreman can judge this.

Taking Care of the Old Men

1—Old machinists can be used profitably as instructors.
2—Salvage work is also good for the superannuated mechanic.
3—A plan for the purchase of profit-sharing certificates works well in one factory as a pension system.
4—Loyalty and long service are good arguments in favor of special privileges to the old-timer.
5—In the professions the experience, wisdom and advice of old men is valued.
6—In like manner shop executives should value the experience of the old mechanic.

Helping Your Men Get Better Jobs

1—The good man cannot be held back anyway, and it is best to help him to a better job somewhere else if none is available in your shop.
2—The foreman should always have ready an understudy for every important job.
3—Keeping a man from promotion because "he cannot be replaced" will make general dissatisfaction in the shop.

Getting To the Big Boss

1—The way to the big boss should be open.
2—Complaints should be discussed first with the foreman.
3—The real foreman has authority to settle ordinary questions.
4—Interviews with the big boss can easily become a nuisance, and the man who runs to him on every little occasion should be warned.
5—If the foreman is the right kind of man, the question of men wishing to see the big boss will seldom arise.

Shop Visiting for the Foreman

1—Visiting other shops increases the foreman's knowledge of methods and equipment.
2—Getting the foreman to write out an informal report on his visit to other plants will aid him to digest and sum up his ideas.
3—If the foreman cannot get away for a few days, his shop is not organized properly.
4—Shop visiting will always broaden out the foreman.
5—Do not expect the foreman to come back every time with new ideas that will directly aid production.
6—Many firms already make it a practice to send their foremen out shop visiting.

The Practical Joker

1—Practical jokes in the shop lead to injuries and interferences with work.

2—Practical jokers generally get angry themselves when the jokes are on them.
3—The shop is safer, and much bad feeling is eliminated, by abolishing the practical joke in the shop.

Who Should Select New Equipment?

1—The plant superintendent should have the final say in the selection of new equipment.
2—The foreman should be consulted, and he in turn should consult the men who use the machines.
3—Care should be taken that a man is not guided in his choice only by the fact that he became used to a machine at some previous date.

Who Should Do the Discharging?

1—The foreman should have the final word on discharge for his own department.
2—The personnel department should be able to transfer a discharged man to another department, unless discharged for some major infraction.
3—A man who cannot succeed under one foreman or in one department may be very good in another place.
4—All discharges should clear through an employment department.
5—The foreman's standing is not lowered by giving a man a job in another department any more than it is when the man gets a job in another shop.

Who Should Go to the Storeroom?

1—Leaving machines idle is a direct loss.
2—Each department should have a storeroom for special tools.
3—Helpers and messengers can be used effectively to bring the tools not furnished when the job is given out.
4—Workmen object to writing out orders or filling out blanks.
5—Tool and material requirements should be planned in advance for the workman as much as possible.

Is the Repetitive Operation to Be Avoided?

1—Some men thrive on repetitive work, while others are dissatisfied and do not do good work unless they can be changed about.
2—The foreman should study the natures of his men and fit them to the jobs.
3—A foreman must know the temperament of his men.
4—A certain amount of shifting can be done even on the repetitive operations.

Do We Buy Labor or Production?

1—The idea is to buy production, but the man's moral influence is highly important.
2—Employees respond to good working conditions and fairness.
3—A good foreman will not permit his men to be on the verge of quitting before raising their wages.
4—By paying wages equal to or above the regular scale, a company can have a choice of the best men.
5—Low wages mean dissatisfied men and high turnover.

How Do Mutual Aid Societies Help?

1—Mutual aid societies eliminate the necessity for collections and charity.
2—The dues should be as small as possible, but regular, and the fund can be aided by entertainments or bazaars.
3—The company can well contribute regularly to the fund.
4—The executive committee should be composed of members from various departments and a representative of the management.
5—The secretary should be paid a small fee.
6—Regular financial statements should be issued.

Advantages of Foremen's Clubs

1—The foreman can learn much from discussion with other foremen from other shops.
2—A foremen's club in a city can easily arrange to have lectures by prominent business and industrial leaders.
3—Regular courses of discussions and instructions have proven successful in foremen's clubs.

Getting Information from Salesmen

1—The good machinery salesman is a traveling consulting engineer.
2—The salesman should be taken into the shop to discuss the machines with the foremen, or even with the men.
3—The salesman sees methods in a variety of shops.
4—If he is the right kind of man he has a bird's-eye view of industrial processes.
5—It will be to the advantage of the shop to let the foreman have a chance to talk matters over with the machinery salesman.

Will Standard T-Slots Help Production?

1—Standard T-slots, arbors, centers, and other mechanical details of the machine that make interchangeability possible will help production in the shop.
2—The practical man wants interchangeable parts on machines.
3—The machine tool builder does not gain in the end by making machines that do not carry the same tools as those of his competitors.
4—It will pay any shop to standardize T-slots and other details on the machines already in its plant.
5—The practical shop man is in favor of having the Standards Committee go ahead with the standardization of machine details.

Arguing with the Big Boss

1—Diplomacy in dealing with the big boss is as necessary as diplomacy with the men.
2—Since the foreman is concerned with methods, it is his right and duty to point out where he differs with the big boss.
3—But the foreman should present facts, not prejudices.
4—To accept orders blindly without stating objections is as bad as the other extreme of arguing excessively.

Ideas from Practical Men

The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Progressive Press Tools

BY FRANK WALDO

Some features that can be applied to the general run of progressive dies are embodied in the blanking die illustrated, used for producing the part shown at *A*. The more important of these features are the method of centralizing the stock, and the variations in the height of the punches, so that the blanking will be distributed over a greater portion of the press stroke.

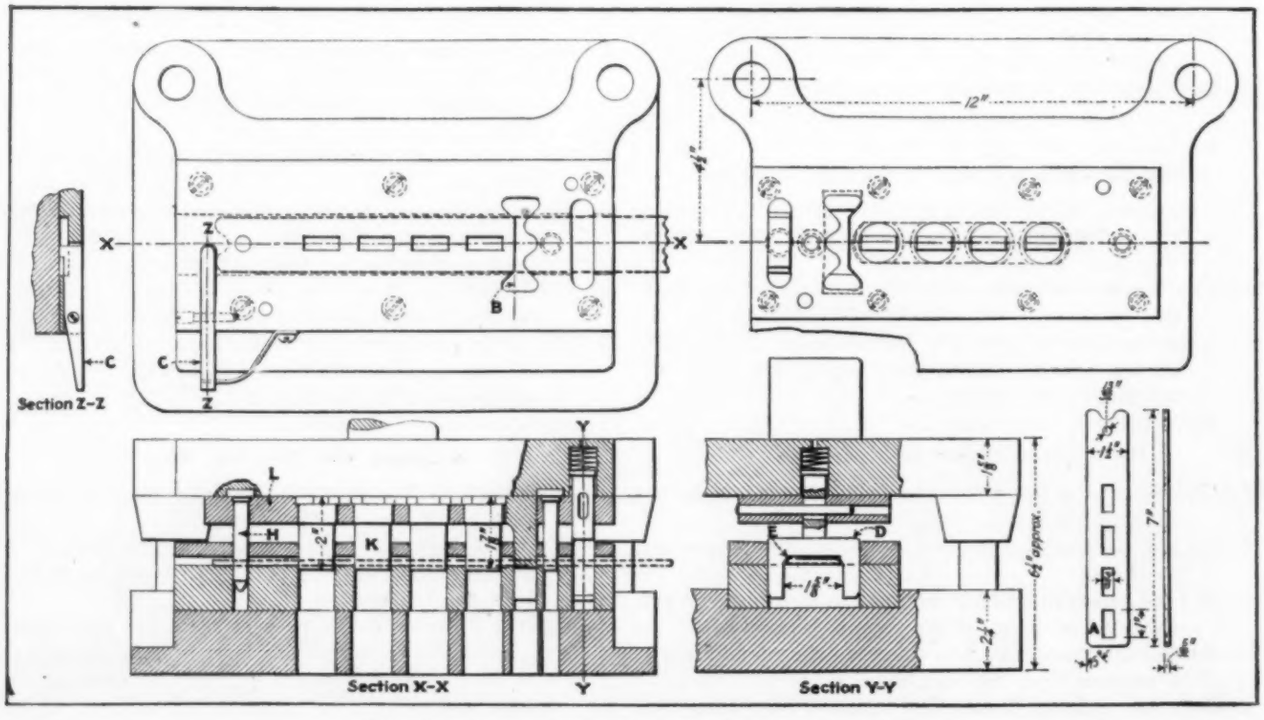
The material from which the part is to be blanked is inserted from the right-hand side of the die to the position indicated at *B*. In this position, one end of the strip is trimmed to an irregular shape and the round hole is pierced. Then the strip is moved to the left until it strikes the finger stop *C*, locating it approximately for the second setting. The strip is centered by the equalizer *D*, the shank of which slides in the punch holder against the pressure of a light spring, so that after the angular corner *E* strikes the work, the equalizer will hold the strip central until the blanking has been completed. To insure a more accurate end location for the setting than is afforded by the finger stop, the pin *H*, engages the previously pierced hole, and centralizes the open end of the strip before cutting takes place. Downward movement of the ram causes the punches to pierce the four rectangular openings, cut off the finished piece, and to repeat the first operation on the next piece. In this way, a piece is completed at each successive tripping of the press.

The heights of the punches are arranged so that the rectangular openings and the round hole are practically completed before the cutting-off punch comes in contact with the strip. The difference in the heights is $\frac{1}{4}$ in. The punches *K* have heads flattened on opposite sides, and are mounted in the recess of the punch holder *L*, as shown. This feature simplifies the assembly of the punches in the holder.

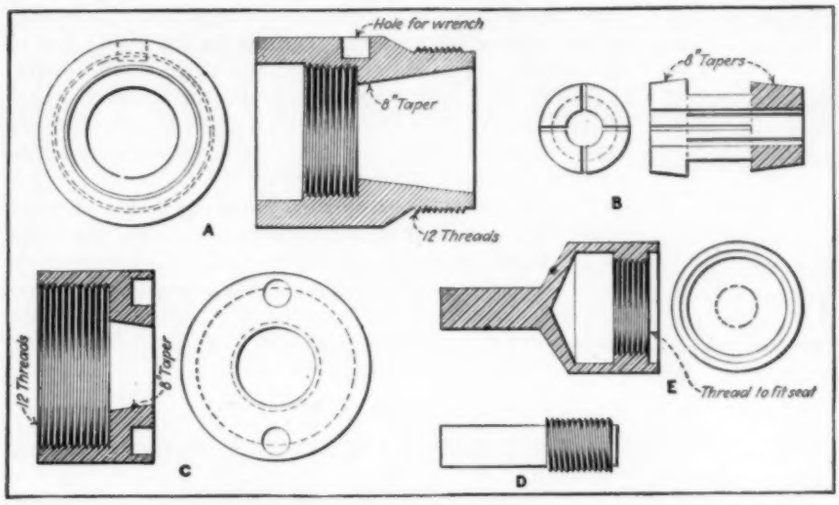
A Heavy-Duty Collet Chuck

BY R. L. WOOD, JR.

A heavy-duty chuck, designed primarily for holding round cold-rolled stock, is shown in the illustration. The body *A* is made of cast iron and is threaded to screw on the lathe spindle. The collet *B* is made of cold-rolled steel and is slit with a hacksaw, each alternate slit being started at opposite ends, as shown. Of course, a sepa-



Details of progressive blanking and piercing tools



Collet chuck and attachments

rate collet is required for each size of stock to be held. The thickness of the collet wall at the small diameter is $\frac{1}{16}$ in., and the bore is from 0.005 to 0.010 in. larger than the stock it is to hold.

The nut *C* is made of steel and has holes drilled in it for a pin wrench for use in tightening the chuck on the stock. We find this chuck very useful in our shop, which is in connection with a large steam-power plant.

Two attachments for the chuck are shown at *D* and *E*, the one at *D* being used for refacing valve disks, while the one at *E* is for a like operation on valve seats.

What is a "Floating Holder"—and Why?

By Robert White

The average mechanic when considering the set-up of a screw machine of the hand or automatic type in which the bore of a given piece of work is to be reamed to accurate size will say that the reamer must be held in a "floating" holder. He will then, if he is doing the tooling himself, select a collet with a hole anywhere from a few thousandths to a quarter of an inch larger in diameter than the shank of the reamer, drill a cross-hole through it, drill a somewhat smaller hole athwart the reamer shank and drive a drill-rod pin in it, so that it will project through the hole he has just drilled in the collet—with the shank inside the collet, of course.

The reamer will now wiggle around in the collet but it cannot turn with relation to it because of being held by the pin, and if the collet is properly secured in the turret of the machine, the tool can be used to ream the hole in the work, the presumption being that it will align itself with the already bored hole because the shank is not rigidly confined in the axis of the collet, and the pin, fitting loosely in the crosshole of the collet, will allow the reamer to assume the alignment of the bored hole.

This presumption appears to me to be absurd. If the hole in the turret is out of alignment with the axis of the machine spindle in a horizontal plane (as it might conceivably be if the index lock-pin was unduly worn or did not function properly) and the position of the pin in the holder is vertical, the reamer could assume alignment with the work only by causing one end of the cross-pin to bear in the hole in the collet wall, leaving the other end unsupported. As soon as even a slight amount of torque is imposed upon the reamer, the other end of the pin will swing into contact and force the shank of the reamer out of alignment. If the turret hole is out of line in a vertical plane, the cross-pin will be tilted and will not get a proper bearing in either side of the collet wall, with the result that the applied torque will tend to bend the pin and thus force the reamer out of alignment as before. If the pin is disposed horizontally the conditions will be exactly the same, but in reversed order. Further, unless the cross-holes in the collet and reamer shank intersect the center of each exactly, the same conditions will prevail, even though the turret hole is in perfect alignment, and it will be impossible for the reamer to assume a correct position.

In order to secure a perfect "float" it is necessary to introduce a full universal joint that will allow the shank of the reamer to move with perfect freedom in *any* direction, yet impose equal resistance to rotation on both sides of the center line.

This can be done by making the hole in the collet sufficiently larger in diameter than the reamer shank to introduce a ring between them, with enough extra space both inside and outside the ring to allow it to assume whatever position the amount of misalignment demands, without coming in actual contact with either the collet or the reamer shank.

The reamer shank is then secured to the ring with a cross-pin that is loose either in the ring or in the shank, and the ring is secured to the collet by a similar pin at right angles with the first. This condition can be brought about only by making the second pin in the form of two studs to be riveted or otherwise fastened to opposite sides of the ring. Obviously, the second pin could not intersect the first without cutting it in two.

Some toolmakers make the intermediate ring in the form of a bushing long enough to be pinned to the reamer shank near its end, and cross-pinned to the collet at the other end of the bushing, beyond the reamer shank. This construction retains the universal principle fully, but it introduces another element that tends to displace the reamer shank sidewise, because of the end pressure of forcing the reamer through the work. Perfect float is assured only when the cross-pins are in the same vertical plane.

Unless the machine is very old, or has been subjected to inordinate abuse, the chances are that a reamer rigidly held by a proper collet will be nearer to perfect alignment with the work than when held by any ordinary cobbled-up device, called a floating holder, for the making of a really effective floating holder is rather a neat job of tool work in itself.

In my opinion there are a hundred screw machine jobs spoiled or done indifferently because of the endeavor to forestall a purely imaginary condition of misalignment, for every one that actually suffers because of such condition.

Engineers have made modern civilization possibile. But it sometimes takes mechanics of the plain or garden variety to simplify some of their designs.

Disk Grinding in a Cuban Shop

By Henry C. Francis

In one of the outlying districts of Havana, Cuba, is a small machine shop and foundry, in which one of the specialties is "flat" or "sad irons" of the stove-heated and hand operated variety. The handles are, of course, cast in place, the grinding of the face being the only machine operation. Several disk grinders having vertical spindles and horizontal tables are used to surface the bottoms, or faces, of the irons. Supported over the grinding disk is a plate as at *A*, Fig. 1. In this plate are openings through which the irons reach the grinding disk *B* below. These openings are laid out as in Fig. 2, some plates holding four irons and some five, according to the size of the irons. The operator loads the machine, by placing the irons in the openings and lets them remain until finished. The weight of the irons is the only feed used. The shop is known as the Funicion Leony and is owned by Arturo Munder.

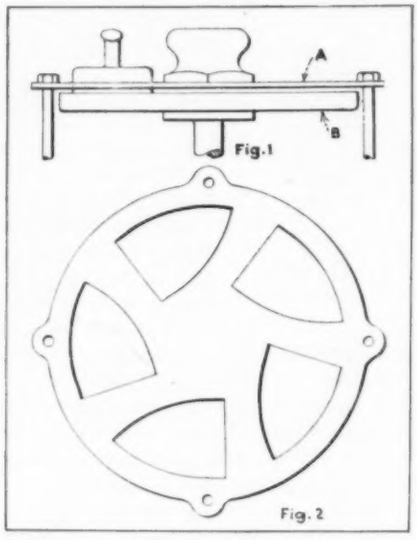


Fig. 1—Grinding disk with irons in place. Fig. 2—Plate for holding irons

Machining Work Beyond the Capacity of Equipment

By Milton Wright

Though modern high-powered machine tools have increased production almost beyond calculation upon repetition work or where the major portion of the time on any job is cutting time, they have their limitations in toolroom service and particularly in the maintenance departments of shops and factories engaged in lines other than metal working.

No small part of the duties of the average maintenance man consist in scheming ways to bore and turn castings or machine parts that are too large for the biggest lathe in the shop, or to plane other parts that will not go between the housings of the only planer available, and for such work the simple belt-driven machines are the most adaptable.

To bore and turn the large flange for which S. B. Richey cut away the shears of his lathe bed and built the special boring tool described in his letter "A Special Boring Rig," published on page 789, Vol. 66, of the *American Machinist*, I should have reversed the position of the lathe head upon the shears so that the work would overhang the end of the bed.

Under this condition the limit of diameter of work that can be held in a chuck or strapped to a faceplate, is twice the distance from the floor to the center line of the spindle. To hold and guide the tools, there is nothing—not even the carriage of the lathe itself—more convenient than the cross-rail of a small planer, mounted opposite to the work and at a right angle to the lathe spindle, on any suitable support.

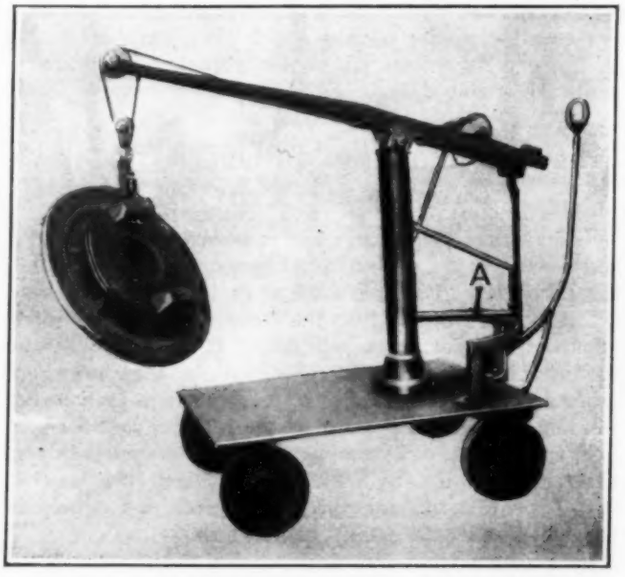
The only special equipment required consists of a few timbers or a pair of wooden horses and some long bolts, all of which may be considered regular equipment in any maintenance department. Of course, one cannot expect to remove a record amount of stock in a given time, but stock removal is usually the least of the items to be considered in such cases.

Home-Made Truck for Erection Work

By George H. Feltner

Odd pieces of material can often be utilized in some way or another to build useful devices at a nominal cost. The crane truck illustrated is an example of such a device built at the Missouri-Kansas-Texas shops, Waco, Texas.

The deck of the truck is made of boiler plate, on which is mounted a small crane. The wheels and the mast are mounted on ball bearings. To enable the boom



Hand truck used in a locomotive repair shop

to hold the load, its rear end is connected by an iron strap to the circular track *A*. The hoisting cable passes over a sheave at the front end of the boom and leads to a hand winch at the rear end. The usefulness of a crane truck of this kind can be easily estimated by those familiar with locomotive repair work.

Polishing the flutes of a drill, reamer or milling cutter is said to increase the efficiency materially by permitting the chips to slide easily over its surface.

Castings and forgings that have been sandblasted are much better to handle than those that come to the shop straight from the foundry or forge. Some shops use this method very largely, others not at all.

Standard T-Slots for Machine Tools

The standard T-slot cutter is shown in Fig. 2, and the standard dimensions are given in Table II. The dimensions of the cutter do not agree with the sizes which have been on the market for many years, but they are in agreement with the simplified practice recommendations of the Department of Commerce. It is accordingly expected that the new standard cutters can be obtained as conveniently and at the same prices as those which were formerly listed.

The standard T-bolt is shown in Fig. 3. T-bolts and slots will be known by the diameter of the bolt, even though in actual measurement the slot will be greater at the throat than the diameter of the bolt. No definite dimensions are given for the chamfering of the corners, which are left to the discretion of each manufacturer to fit his particular needs.

Where the ends of the T-slot in the machine table are obstructed so that the bolts cannot be slipped in and out, standard T-nuts are to be used. The standard adopted is shown in Fig. 4, and the dimensions are provided in Table IV. This standard calls for the use of a stud of a smaller size than the T-bolt for the corresponding slot, in order to obtain the full strength of the nut. If small or larger sizes of T-slots and T-bolts are required than those shown in the tables, the geometric progression used for the sizes listed are followed. All standard dimensions given in the tables are in inches. The tolerance used for the width of throat of the slot is minus 0.001. The tolerances for the diameters of bolts and studs, and for the thread, are in accordance with the American standard screw threads, coarse thread series, medium fit. There are no tolerances given for the total thickness or for length of the T-nuts as these do not need to be held to close limits. The tolerances for width of tongues are left to the discretion of the manufacturers, but the committee recommends the use of the standard tolerances and allowances for metal fits as previously adopted by the American Society of Mechanical Engineers.

The standard inserted tongue and the standard solid tongue for fixtures for a single width of T-slots are shown in Fig. 5, and in Table V are given the standard dimensions for both the solid and reversible tongues for these slots.

Fig. 5—Standard inserted and solid tongues

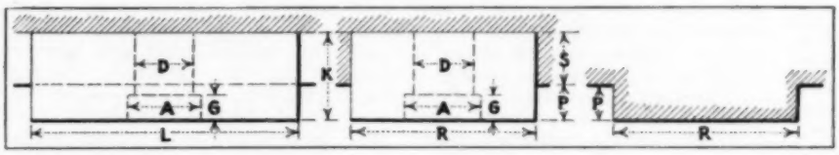


Table V—Inserted and Solid Tongues and Seats for Single Width T-slots

Diameter of T-bolt	Tongue Dimensions: Width R	Length, L	Projection, P	Depth of Seat, S	Total Thickness, K	Screw Dimensions: Diameter of Screw, D	Number of Screw	Threads per Inch	Diameter of Head, A	Thickness of Head, G
¼	9/32	3/8	3/32	1/8	7/32	0.125	5	40	0.196	0.081
5/16	11/32	15/32	1/8	9/32	9/32	0.164	8	32	0.260	0.107
3/8	7/16	9/16	1/8	5/16	5/16	0.190	10	24	0.303	0.124
½	9/16	¾	1/8	7/32	11/32	¼	..	20	0.375	0.130
5/8	11/16	15/16	1/8	¼	3/8	¼	..	20	0.375	0.130
¾	13/16	1 1/8	5/32	9/32	7/16	5/16	..	18	0.438	0.150
1	1 3/16	1½	7/32	11/32	9/16	3/8	..	16	0.500	0.170
1 1/4	1 5/16	1 7/8	¼	3/8	5/8	3/8	..	16	0.500	0.170
1½	1 9/16	2¼	5/16	7/16	¾	½	..	13	0.625	0.210

Fig. 6—Standard reversible tongue

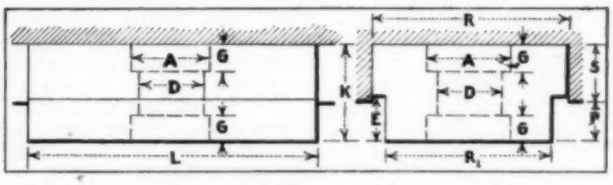


Table VI—Dimensions for Reversible Tongues and Seats for Two Sizes of T-bolts

Diameter of T Bolt Small	Diameter of T Bolt Large	Tongue Dimensions: Width R	Width R	Length L	Projection P	Depth of Seat S	Total Thickness Including Tongue K	Height of Shoulder E	Screw Dimensions: Diameter of Screw D	Number of Screw	Threads per Inch	Diameter of Head A	Thickness of Head G
¼	5/16	9/32	11/32	15/32	1/8	5/32	9/32	1/8	0.164	8	32	0.260	0.107
5/16	3/8	11/32	7/16	9/16	1/8	3/16	5/16	9/64	0.190	10	24	0.303	0.124
3/8	½	7/16	9/16	¾	1/8	7/32	11/32	5/32	0.250	..	20	0.375	0.130
½	5/8	9/16	11/16	15/16	1/8	¼	3/8	9/32	¼	..	20	0.375	0.130
5/8	¾	11/16	13/16	1 1/8	5/32	9/32	7/16	3/16	5/16	..	18	0.438	0.150
¾	1	13/16	1 1/16	1 ½	7/32	11/32	9/16	¼	3/8	..	16	0.500	0.170
1	1¼	1 1/16	1 5/16	1 7/8	¼	3/8	5/8	5/16	3/8	..	16	0.500	0.170
1¼	1½	1 5/16	1 9/16	2 ¼	5/16	7/16	¾	11/32	½	..	13	0.625	0.210

Continued on sheet 136

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Technical Abstracts

Idlers, Belts and Pulleys

It is not poor engineering practice to place an idler pulley near the driven pulley when the driven pulley is the smaller of the two. The best practice is to place the idler close to the small pulley, regardless of whether it is the driven or the driving pulley. The direction of lap is dependent more upon the direction of slip than it is upon the direction of motion. Since slip is usually greater on the smaller pulley and always towards the tight side, the lap should be placed in relation to it so that the joint will have little tendency to roll or peel. I would also discourage the use of leather covers for facing pulleys, because such covers are conducive of excessive wear.—J. R. Reed, *Refrigerating World*, May.

Growth of Air Transport

Chicago, due both to its geographical location and to the progressiveness of a few of its citizens, is becoming an important air-transport center, even though Chicago business men, as a whole, do not seem to have even yet realized the possibilities of aviation. There are however, six air lines now operating out of Chicago and municipal co-operation seems assured, so that this point is likely to become as much of an airport as it is a railroad center.

Several thousand miles away, in Russia, we also find a decdied increase in air transport service. According to W. Wishneff, inspector of Civil Aeronautics in Russia, there are five commercial air lines totaling 3,728 miles. These lines in 1926 flew 820,000 miles—carrying 4,035 passengers and 186,034 lb. of mail and freight. Other commercial activities brought the total up to 982,500 miles and 12,487 passengers, with but one accident, in which two were killed. In 1925 however, with 558,750 miles and 3,398 passengers, there was not a single serious accident. Some of these lines are over very difficult country. Locust dusting has reclaimed large areas that were previously not available for cultivation.—*Aviation*, June 6.

What Is Japanning?

Oriental lacquer made from Japanese lac must not be confused with the nitrocellulose or pyroxylin lacquers, which are chemical compositions and purely American inventions. Likewise, the lac from the lac tree must not be confused with shellac, which is formed from the body of an insect. Japan lac is obtained from a tree very similar to the American sumac. European japanners did not have the patience to follow the Japanese process in applying thirty or forty coats over a period of six months, so they made imitations. One of the oldest United States patents was taken out by John J. Howe, of Derby, Conn., in 1856, and covers the japanning of pins. It uses the old term, japan varnish, in place of the modern term, japan.

The terms japanning and enameling are often associated together. But the term enameling in reality refers to the class of baked finishes that do not include black. Japanning refers to black finishing, and enameling refers to colors. Basically, japan is made of a pigment, a drying oil, and a reducing agent. The drying oil is burned out or oxidized during the baking process in the japanning oven. But the heat does not effect the pigment, which is a kind of asphalt called gilsonite. The heat of the oven causes this material to flow in a beautiful, smooth, uniform sheet. The result is that japanning is a process of applying a mineral coating to metal. It is the cheapest known metal finish, and by far one of the most durable. It cannot be applied to wood or to any material that will not stand being baked at 325 deg. F. All materials that are applied and baked below that temperature are paints, and not japan.—William J. Miskella, *Industrial Gas*, June.

Use Electric Welding Process to Strengthen Bridge

What is believed to be the first application of electric welding in the reinforcing of a bridge, has been carried out in strengthening the superstructure of the Chicago Great Western bridge over the Missouri River at Leavenworth, Kan., by adding cover plates to certain members.

All of the cover plates were secured in place by bead welding along the edges. On the chord members the welds were continuous. On the floor beams the weld was continuous for 2 ft. from the ends, and on the stringers from 2 ft., 6 in. from the ends, with welds 1½ in. long at spacings varying from 4 to 6 in., center to center, for the remaining length of the plates. In addition to the bead welding, the cover plates on the chords were stitch welded along the longitudinal center line, through 15/16-in. holes punched and reamed on 12-in. centers.

The welding was done without interruption to train service, but was discontinued while trains were crossing the bridge. To insure that the new material be subjected to live-load stress, the plates first were welded at each end.

An average of 20 men was employed for two months. Four welding machines were used, two of them being a. c., while two were d. c. machines.

The weight of the new cover plates welded in place was over 100,000 lb. About 7,500 lin.ft. of weld was made, for which 1,950 lb. of welding steel was used.—*Railway Age*, June 16.

Future Relations of Capital and Labor

At the dedication June 4, of the new building for the Harvard School of Business Administration, Owen D. Young, chairman of the board of directors, General Electric Co., delivered a talk, peering into the future of great business organizations.

As business increased in size and scope it was no longer possible for one man to control a whole business. His capital, labor, and knowledge were insufficient; therefore the partnership, and later the corporation, was substituted for the individual. This brought large amounts of capital and large numbers of workers together, but we have been put to it to discover the true principles that should govern their relations.

Gradually the conflict between the two is being reduced. We are learning that an increasing wage is consistent with a diminishing commodity price and that productivity is not measured only by hours or amount of fatigue. We are endeavoring to ascertain the limits within which men may work with zest and spirit and pride of accomplishment.

Are we providing cultural opportunities for our families as well as necessities? Are we free men? No man is wholly free until he is both politically and economically free. No man with a failing business or an inadequate wage is free; he is unable to meet his obligations to his family, to society, and to himself.

Zest in labor is influenced by the consideration of whether a man is a hired man or is working for himself. Formerly it was thought that capital was the employer, buying labor as cheaply as possible, and that capital was entitled to all the profits. Capital justified itself by the plea that it took all the risk. Men resented being servants to a master and realized that they took some of the risk since they learned specialized jobs, bought homes, and made ties; all of which depended on the success of a business. If the business shut down they must learn new trades and find new friends, probably late in life.

We are making great progress in these difficult relationships. One group of human beings put capital and another group put their lives into a common enterprise for mutual advantage. We think no longer of managers as partizan attorneys of either group against the other; but rather, as trustees for the whole undertaking, to see that capital gets a suitable return and labor gets an adequate reward and continuous work. This ideal is not reached, but it marks a great advance to have formulated the objective.

Perhaps some day labor may be so organized that it will be the employer,

buying capital for as little as possible and being entitled to all the profits over the cost of capital. It is to be hoped that the day will come when business will belong to those who give their lives to it. Then capital will be a tool and all will be interested in working it to the highest advantage. Then we shall have no hired men.

The fact that such a condition does not exist today is not because of the greed of capital or the desire of capital to enslave labor, nor is it because of a lack of resources on the part of the combined workers. It is because of the unwillingness of men to take the risk of a co-operative undertaking. But men are now becoming both workers and investors.

The matter of unemployment is the greatest economic blot on our capitalistic system. Managers of business have not yet learned how to make their system function so that men willing and able to work may do so. There is no limit to the consumption of the world. The world does not owe men a living, but business owes men a chance to earn a living.

The research workers in pure science, closely followed by the applied scientists, are opening up new fields of business. Never were opportunities so great as now. Never was a more responsible trusteeship needed for the discovery of new opportunities or for the administration of the existing powers. We need today men skilled in the technique of business—men who not only have a broad outlook in history, politics, and economics—but men who have also a moral and religious training that tends to develop character.

Today business assumes the obligations of a profession, which means responsible action as a group, devotion to its own ideals, the creation of its own codes, the capacity for its own discipline, the awards of its own honors, and the responsibility for its own service.—*Printers' Ink*, June 9.

Paper Tests for Blanking Dies

The test consisted in placing a sheet of tough paper on the die and allowing the punch to enter to a depth of about 0.0015 in. The clearance was supposed to be about 0.0025 in. on all sides of the punch and a bond paper of 0.003-in. thickness was used for the impression. If the clearance is exactly right it will be indicated by the clean folding of the paper all around without any breaks except, possibly, at very sharp angular corners. In others words the paper is compressed about 0.0005-in., whether the edges of the tools are sharp or dull.

If the clearance is decreased beyond this point, however, the paper will be broken; a very clean cut showing the existence of sharp edges on both punch and die while a ragged cut would indicate either a dull punch or a dull die in addition to insufficient clearance, or else it would show a condition where, although the tools were sharp, there is still enough clearance to prevent the paper from being cleanly severed yet not enough to keep it from being broken.

Examination with a high-powered glass will show which condition exists, as the dullness or sharpness of any portion of either punch or die will be reflected in the appearance of the impression of the cutting edge in the paper.—Henry Simon, *Machinery*, May.

Air-Compressing Equipment for Japanning

A coat of japan is applied either for appearance or for protection, but in either case, dirt or oil spots are detrimental. Care must be used in selecting auxiliary equipment as well as actual spraying equipment, if a fine finish is to be obtained.

Air-cooled and water-cooled equipment has been used by the japanner, the former for small production and the latter for large production. Whichever is used, it is important to prevent any lubricating oil from becoming mixed with the japanning material. Trapping devices are often used for separating oil and moisture from the compressed air.

It is necessary that the air receiver be a carefully tested tank, because of the danger of blowing up with resultant damage to life and property. Some cities require the use of riveted tanks while others permit welded ones. In order to prevent continual operation of the safety valve it is usually set about 10 lb. higher than the pressure to be carried.

The moisture from the compressed air collects on the inside of the vertical receiver and runs down to the bottom where it may be drained off by means of a valve. The tank usually has a convex top and a concave bottom, but in some cities it is required that the convex end be down in order to form a funnel-shapel bottom to drain off all moisture. If the tank is installed with the concave end at the bottom there is a tendency for water to remain in the sharp corner inside and eventually cause a weak spot.

The unloader is a device provided with regulating means that will cause the large valve inside to operate at any desired pressure. When the desired pressure is attained this device closes the air intake of the compressor. The motor is doing no work, simply turning the flywheel, until the pressure drops to a predetermined amount when the intake valve is opened again.

About 25 per cent of the power consumed when the compressor is working is required when it is running idle. Because of this small power consumption during the idling period, it is customary to allow it to run all day, taking care that the oil in the crankcase does not run low.—*Fuels and Furnaces*, June.

Available Iron Ore Supply

Of the 30 billion tons of commercial iron ore existing in the world, about 80 per cent is in five countries. In the order of their tonnages, these are: Brazil, United States, France, Newfoundland and Cuba. The British Isles and Germany have only about 3 per cent each. But out of the 30 billion tons, called commercial because of its quality, a considerable proportion is not available. Transportation and markets are of great importance, and these have their effect upon the ore deposits of Brazil and Newfoundland. On the other hand, the lean ores of England that could not be used in this country are available for use there, because of population and the character of the fuel supply. The growth of the iron industry of a country depends largely upon the character, extent and availability of its coal resources.

Half of the six or seven billion tons of commercial ore existing in the United States is close to Lake Superior, where mines, railroads and harbor facilities have been co-ordinated into a smoothly running machine of great efficiency. Most of the remaining half of the commercial iron ore in this country is in the southern states of Alabama, Georgia and Tennessee. Birmingham can make iron at a low cost, because of the nearness of ore, fuel and flux. In the past ten years the Lake Superior region has supplied 510,000,000 gross tons of ore. At the present rate of consumption, lake ores will lay only one-eleventh as long as those of the Birmingham region. But geologists state that there are 70 billion tons of lean ores in the lake region available when the rich ores are exhausted. As far as can be seen, the United States will remain the chief iron and steel making country as long as we can mine commercial ore.—Dwight E. Woodbridge, *The Iron Age*, June 9.

Cause of Airplane Engine Failures

In a paper recently read before the French Society for Aerial Navigation by Chief Engineer C. Martinot Lagarde, airplane engine failures were carefully analyzed and discussed. In 1925 only 12 accidents out of 91 could be positively traced to the engine. In 1926 there were 92 accidents, accounted for as follows: faulty fuel supply, 23; faulty ignition, 2; faulty lubrication resulting in breaking the crankshaft, 2; defective cooling systems, 2; undetermined causes, 3. These breakdowns were, for the most part, with engines that are now obsolete. Spark plug life is short, 40 to 100 hrs., the great danger being in dropping the faulty electrode into the cylinder.

Pistons give the least trouble—those with crowned heads and piston pins fixed in the piston bosses, being the worst offenders. Pistons with flat heads and floating pins seldom fail in operation.

In V-type engines connecting rods and crankshafts are still the most fragile parts. Crankshaft breakage is much more frequent where engines do not have a supporting bearing each side of the throw. The forked type of rod breaks more often than where one master rod and articulated rods are used. Centrifugal lubrication of crankpins gives less trouble than pressure lubrication, probably because it is not affected by a little play in the bearings. Of cooling troubles, cylinder jacket leaks were 12 per cent; radiator leaks 34 per cent and troubles in the piping 21 per cent.—*Automotive Industries*, June 11.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Is the Calendar Permanently Tradition Bound?

FOR many centuries mankind, or at least the portion of it that calls itself civilized, has been getting along with a calendar that was distorted to tickle the vanity of two Roman emperors. Until a generation or two ago the varying lengths of the months and the constant changing of holidays made very little difference, but now, when business success may hinge on accurate, comparable records, the old vehicle becomes cumbersome and creaky.

One of the greatest waste eliminators conceivable would be a calendar so arranged that the months were all of the same length and contained a whole number of weeks without any odd days. Such a calendar was worked out years ago and only waits on the arousing of sufficient public interest before it becomes an established fact. It is encouraging that a man of George Eastman's standing and means has undertaken to stand solidly behind the movement. No man could ask a more enduring monument than the successful revision of our antiquated calendar.

Are we to be bound always by tradition? Certainly Colonel Lindbergh would never have ventured across the Atlantic had be listened to the warnings of tradition that the trip had never been made by a single voyager, that solar observations must be made to insure reaching the objective, that more than a single engine was needed so that there might be power in reserve. But tradition did not hamper him and success is his. Could we but follow his brave example in so safe an adventure as a revision of the calendar we should reap even greater rewards.

The Boy Scout As Machinist Material

WITHIN a few days the Boy Scout Movement will celebrate its seventeenth anniversary. It is safe to say that most men believe heartily in boy scout activities and support them when they can as constituting a force for good.

Probably very few know that there is a direct tie-up between the boy scouts and the machine industries. It is not surprising, of course, that in a machine civilization such as ours the younger generation should take an interest in machinery. The boy scout is typical. So keen has been his interest that as long ago as 1919 a special pamphlet on the subject was prepared and a merit badge instituted for those who specialize in machinery. Last year nearly a thousand scouts received this honor.

The idea behind the booklet is not to give any sort of training but to inform the boy of the advantages and opportunities in the field of mechanical engineering. To win the merit badge he must describe the construction of a lathe, planer, shaper, drill press and steam boiler, and explain the purpose for which each is intended. He must also name at least twelve of the principal hand tools used by machinists; construct a wood or metal model of some mechanical device; and have at least one month's experience in a shop.

In view of the difficulty sometimes encountered in persuading promising boys to undergo the training leading up to the trade of machinist does not the boy scout organization of your vicinity seem to offer an opportunity? It may be well worth your while to get acquainted with the men who are running it and see what they are doing.

Productive Overhead

OVERHEAD has long been most unpopular in the eyes of shop managers and accountants. We have tried to shun it like a plague or an epidemic. Yet in these days of highly specialized machine production, direct labor costs have decreased to a remarkable degree. And "overhead," based on direct labor as has been the custom, necessarily increases as we replace manual labor with machinery.

In another column our old friend Godfrey shows how improved machinery, which we still call overhead, is often more profitable than labor. He also shows how men whom we usually class as nonproductive are really among the largest factors in paying dividends.

It is probable that new terms and definitions would help us in looking at the whole subject in a much more practical manner. The use of terms that have been applied to undesirable qualities makes it difficult to consider them from any other angle.

Col. Lindbergh can hardly be accused of being timorous or ultra-conservative regarding aviation. For this reason his warnings against the injudicious offering of prizes for hazardous flights should be heeded. Too many overlook the importance of navigation. Col. Lindbergh's success with the earth inductor compass should not mislead others to think that nothing else is necessary. A few casualties, such as might occur with any small sea craft, would harm aviation more than another success would aid it.

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Barnes No. 210 All-Geared Gang Drill

THE Barnes Drill Co., Rockford, Ill., has developed the No. 210 all-geared gang drill, shown in the accompanying illustration, for single-purpose production work where frequent changes of speeds are not necessary. A wide range of speeds can be selected, however, by interchanging the crown gear and the take-off feed gears. The three-spindle machine is illustrated; in addition two and four spindle models can be supplied.

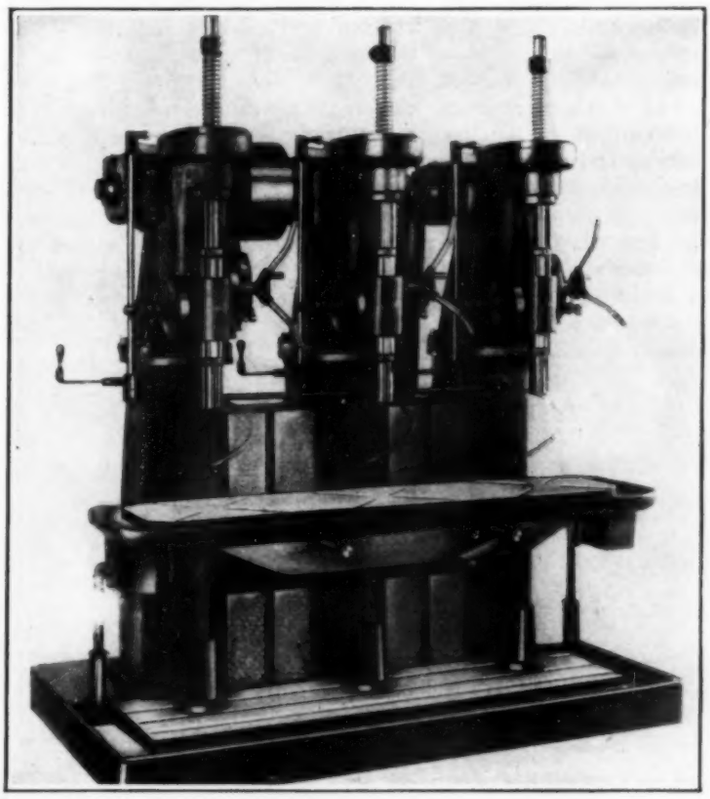
The box column is of sturdy design and the heads are securely bolted thereon. This construction is said to provide for a raising block or a longer column where greater distance is required between the spindle nose and the table or base. The head is a unit in itself, and contains all the working parts, including the pump for the self-oiling system but not the coolant pump. The base is of improved design, having a surrounding oil channel, and contains the coolant sump with suitable covers and strainers. There is also a finished surface on the base for long work that necessitates the removal of the table.

Each spindle is provided with six splines, and it is claimed that with this construction no binding of the spindle in the crown gear occurs when doing tapping or heavy work. The thrust is carried on a roller bearing having a double row of staggered rollers. The drift hole is below the sleeve and a No. 4 or 5 Morse taper can be furnished as required.

The heat-treated steel crown gears may be quickly changed for faster or slower speeds. Feed slip gears are conveniently located on the right-hand side of the machine for quick substitution when changing set-ups. The gearing throughout is made of alloy steel and all important gears are heat-treated, thus assuring durability. In each head there are ten radial ball bearings of standard size for the gear shafts and crown gears, all of the automatically lubricated.

Ordinarily individual motor drive is furnished each head through flexible couplings. Silent-chain motor drive with a single drive shaft for all spindles may be used in place of individual motors, or a single pulley drive can be obtained. Silent chain or pulley drive is necessary for automatic reverse for tapping. A 5-hp. motor operating at 1,200 r.p.m. is recommended for each spindle or a 10-hp. motor for a three-spindle gang. Single pulley drive, operating at 600 r.p.m., has an inclosed, self-oiled, multiple-disk clutch gear with integral brake, which stops the spindle instantly when the clutch is released. For tapping work a reversing multiple-disk clutch gear is added and is controlled separately.

With single-pulley drive, spindle speeds ranging from 120 to 977 r.p.m. can be obtained. With the silent-chain motor drive, the speed can be reduced to as low as 20 r.p.m., while with direct motor drive speeds ranging from 239 to 2,000 r.p.m. can be obtained. Feeds ordinarily range from 0.005 to 0.047 in. per rev., but



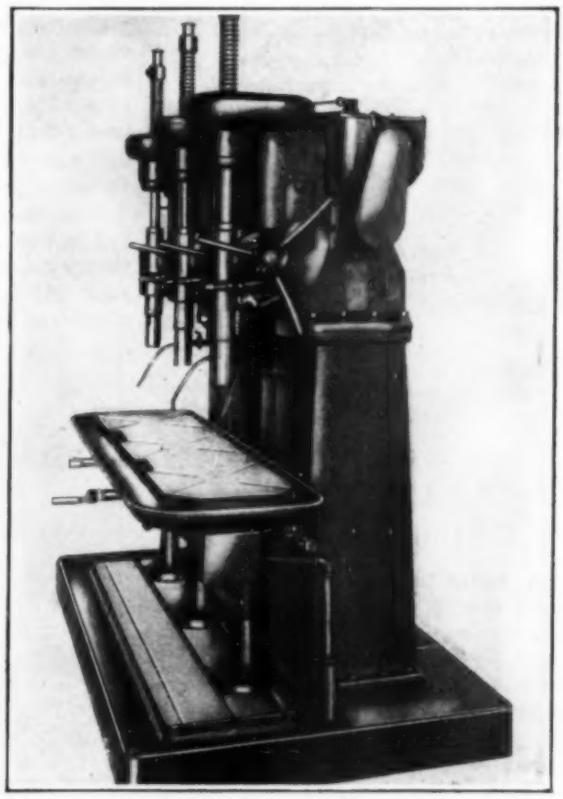


Fig. 1—Barnes No. 210 All-Geared Gang Drill. Fig. 2—Side view of the machine

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faster speeds can be obtained for reaming.

Hand feed is provided the spindle through a star wheel on the right hand side. The leverage ratio is 1 to 35 through an internal gear.

The table is of ample proportions and is rigidly ribbed and braced. It is surrounded by a wide oil channel. The table is gibbed to double column ways and may be securely clamped in any position. In addition, it is supported by the raising screws which serve as jacks.

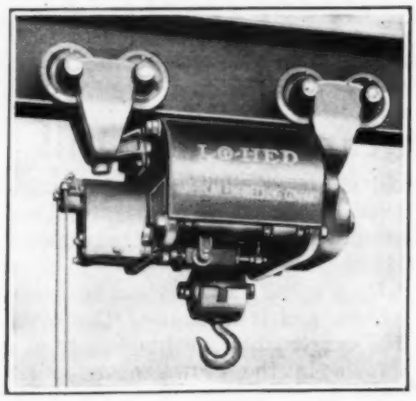
Among other features of the spindle construction is the rack attached to the sleeve by dovetail construction without the use of screws. This feature has been patented. A counterbalance device is also provided as well as a safety device to prevent overloading and to minimize breakage of twist drills. A patent is also pending covering the spur-geared feed mechanism.

SPECIFICATIONS

Capacity of machine in solid steel, high-speed drills, in...	⅜ to 1½
Height of machine, in.....	76
Distance from center to center of spindle, in.....	24
Distance, center of spindle to face of column, in.....	10⅝
Maximum distance from regular table to nose of spindle, in...	27¾
Maximum distance from base to nose of spindle, in.....	45½
Maximum distance from table to floor, in.....	41
Spindle travel, in.....	12
Vertical travel of regular table, in.	17
Working surface of table, 2-spindle machine, in.	16x44
3-spindle machine, in.	16x68
4-spindle machine, in.	16x92
Floor space, 2-spindle gang, in.	49x56
3-spindle gang, in.	49x80
4-spindle gang, in.	49x104
Weight, 2-spindle gang with individual motors and starter, lb.	7,650

"Lo-Hed" Electric Monorail Hoist

A motor-trolley electric monorail hoist that operates in 15¼-in. headroom is announced by the American Engineering Co., Philadelphia, Pa., as an addition to its line of "Lo-Hed" hoists. This hoist is built in half-ton and ton sizes and is similar in construction to the standard Class A Lo-Hed hoists except that it is



"Lo-Hed" Electric Monorail Hoist

mounted on an 8-wheel trolley which gives it 5 in. less of headroom.

It is designed for operation with alternating current at 20 ft. per min. or direct current at 20 to 40 ft. per min. A special high-speed hoist can be provided for operation at 40 ft. per min. with alternating current or at 40 to 80 ft. per min. with direct current. The standard height of lift is 20 ft., but when required a lift of 25 ft. can be provided. Four ropes are used.

A fully-inclosed, ball-bearing motor especially designed for hoist service is used. Hyatt bearings are used on the gear shaft and in the trolley wheels. Alemite lubrication is provided on all bearings not automatically lubricated by oil bath. Holding and lowering brakes give full control of the hoist at all times and combined with a limit device insure safety in operation.

The hoist is said to travel on curves of short radius and shifts easily over switches. It was designed to meet the needs for ease of handling and conveying material with minimum headroom conditions and for moving and lifting bulky objects over crowded shop or warehouse floors where clearance is at a minimum. It also permits the stacking of materials to greater heights.

Potter & Johnston 6-DP Platen-Type Automatic Chucking Machine

THE 6-DP automatic shown in the accompanying illustrations and made by the Potter & Johnston Machine Co., Pawtucket, R. I., is a platen-type machine and is adapted to a wide range of chucking and between-centers work. It is capable of taking a number of cuts simultaneously. One man can operate several machines.

The base is of heavy box construction with wide flat ways, front and rear. It is so designed as to allow plenty of chip clearance. The machines are furnished with a pan base which serves as a reservoir when a cutting lubricant is required. The machine is of unit construction in that the headstock, feed box and platen are assembled separately. The drive is by a constant-speed pulley equipped with a multiple-disk clutch and brake. The machine is provided with four automatic changes of speed. Multiple-disk clutches are also used within the headstock to effect these speed changes, which are entirely independent of the

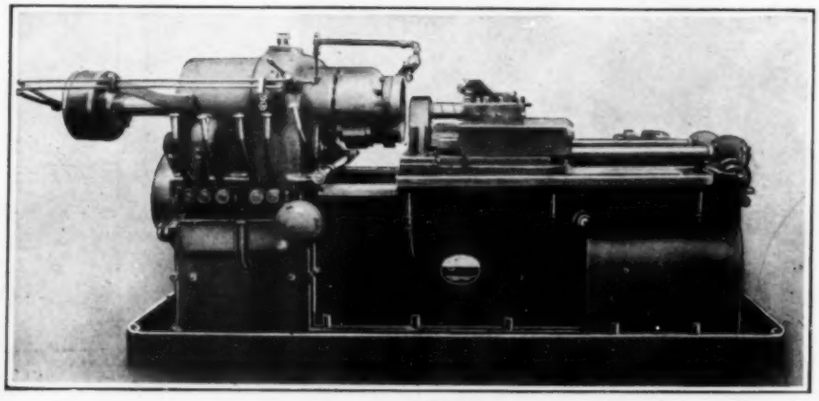


Fig. 1—Potter & Johnston 6-DP Platen-Type Automatic Chucking Machine

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variations possible in the individual slide cams. All shafts are of large diameter and are made of chrome-nickel steel, heat-treated, as are all the gears, which are spiral in form. The spindle itself is a high-carbon steel forging and is mounted on Timken tapered roller bearings. An automatic type of spindle stop is provided to allow the cutting tools to return to their neutral position without scoring the work. Where advantageous, the machine may be provided with a standard unit giving three selective automatic changes of feed.

The platen, or table, is of heavy construction and is moved to and fro by a cam drum, provided with hardened cams ground on the dwell. The movement of the platen, therefore, may be utilized for cutting as well as for bringing the tool slides into operative position. On this platen is mounted a plate, on which may be fastened the requisite number of tool slides.

For work between centers the machine is furnished with a live center, mounted on Timken roller bearings, which is bolted on the main platen. When work of this character is handled, the platen is clamped to the bed.

Standard tool slides of heavy construction and approximately 10x18 in. in size, are provided. The entire feed mechanism for these slides runs in oil. The roll stud is mounted on ball bearings and the camshaft is provided with a ball thrust of liberal dimensions. Three-jaw geared scroll chucks of 16 and 18 in. can be supplied for the machine. Oil pump and piping are also furnished for machines handling material requiring a lubricant.

Where motor drive is desired, the motor is mounted on a plate directly on the headstock and the drive is by multiple V-belt to the single driving pulley operating at 1,200 r.p.m. A 15-hp. constant-speed motor is recommended.

SPECIFICATIONS

Platen size, in.	50½x45
Swing over top of platen, in.	17¾
Swing over gap in platen, in.	23¾
Travel of platen, in.	12
Platen adjustment, in.	6
Maximum travel of tool slides, in.	6
Maximum length of work to be centered, in.	18½
Diameter of hole through spindle, in.	2⅝
Net weight, lb.	10,800

Matthews Portable Refinishers and Buffers

The Matthews Manufacturing Co., Newton, Iowa, has brought out two portable refinishing and buffing machines. Model M-1 is shown in Fig. 1 and is designed especially for refinishing aluminum and copper washing machines, but it can also be used for all kinds of finishing operations. In the illustration it is shown with

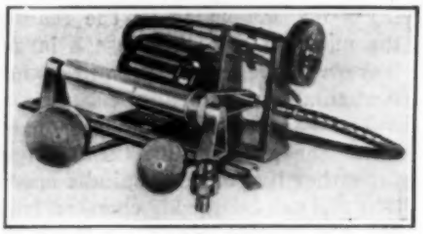


Fig. 1—Matthews Model M-1 Portable Refinisher and Buffer

a wringer roll refinisher attachment.

Model M-1 is mounted on a base 9x14 in. and is 10 in. high. The entire unit is mounted on a compact bench-type swivel tripod. When not in use, the shaft handle rests loosely in two sockets. These sockets are equipped with a concave hinge that springs closed and forms a rigid portable emery wheel stand. The motor is rated at ½ hp. and operates at 3,400 r.p.m. It is designed for use on 110-volt, 60-cycle current.

The flexible shaft is the Strand No. 5 and is 5½ ft. in length. The handle is 7 in. long to allow easy access to corners. A Riehl wire wheel, 5 in. in diam. and using No. 34 wire; a buffing wheel 5 in. in diam. made up of 72-ply cotton stitched to within ½ in. of the edge; and a Carborundum or Norton grinding wheel, 4 in. in diam by ½ in. face, are regularly furnished. An Almond chuck

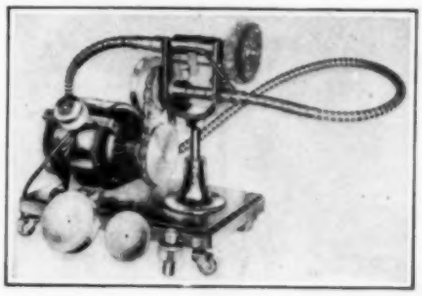


Fig. 2—Matthews Model M-2 Portable Refinisher and Buffer

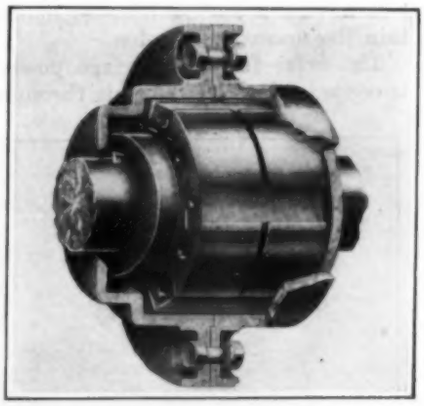
of ⅜-in. capacity is also furnished for use in drilling operations.

The M-2 unit, shown in Fig. 2, is equipped with a ½-hp. motor operating at 1,725 r.p.m. and is for use on 110-volt, 60-cycle circuits. The base measures 12x18 in. and is mounted low on casters. The motor carries a two-step grooved aluminum pulley driving a similar pulley, mounted on the countershaft, through a Graton & Knight link-leather V-belt. Two speeds are available of 1,000 and 3,500 r.p.m. on the flexible shaft. The same equipment is used on this machine as with the Model M-1 except that the shaft is one foot longer and the wire wheels 6 in. in diameter.

Nicholson Improved Flexible Coupling

Improved lubrication features have been added to the flexible couplings manufactured by the W. H. Nicholson & Co., Wilkes-Barre, Pa. The original design was described on page 812, Vol. 65, of the *American Machinist*.

From the illustration it will be noted that holes are drilled longitudinally through the floating keys and the hubs. These holes act as reservoirs for oil. A lip is now extended from this casing over the left hub of the coupling, and into this lip



Nicholson Improved Flexible Coupling

oil can be squirted either while the coupling is standing or in motion.

With the added space provided by the holes in the lip, the coupling is said to carry approximately 150 per cent more oil than the older type. The improved type is known as Style A and the old type without the oil lip is Style B.

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Landis Self-Contained Universal Grinders

A LINE of self-contained universal grinders ranging in size from 12x30 in. to 16x60 in. has been developed by the Landis Tool Co., Waynesboro, Pa. These machines have practically the same range and all of the features of the standard Landis countershaft-driven universal machines, which have been on the market for some time. Each machine is driven by three motors; one for the workhead, one for the wheelhead and one for the carriage traverse and water pump.

The headstock is driven by ½-hp. adjustable-speed motor with field rheostat control. The motor is for operation on direct current of either 115 or 230 volts. It is mounted directly on the headstock and drives through sprockets and silent chain to a worm shaft. The worm in turn drives a worm gear mounted on the spindle. The worm is steel, hardened and ground, while the worm gear is made of high-grade bronze. The unit is partly submerged in oil to provide lubrication for the driving worm.

The drive for the wheelhead is through a 3-hp. constant-speed motor mounted directly on the wheelhead slide. The power is transmitted to the spindle through a multiple V-belt having a spring idler to maintain the necessary tension.

The drive for the carriage power traverse and water pump is through a 2-hp. constant-speed motor operating at 1,750 r.p.m. This motor is mounted on the rear of the water tank and drives by chain to a shaft on one end of which is the impeller of the water pump. From the other end of the shaft the power is transmitted to a 2-speed gear box providing both gear and friction feed changes, as required.

Facilities are provided for mounting a d.c. generator on the rear of the machine. In this case a larger traverse drive motor is required than is regularly provided.

The headstock, which is movable along the swivel table, is arranged for either live or dead spindle operation and can be quickly changed from one type to the other. It is of the universal type and can be swiveled to grind short tapers from 0 to 90 deg. or for face grinding.

A single lever controls the starting and stopping of both the work and power traverse. It is also possible to use the power traverse without rotating the work, if desired. The regular reversing mechanism used on the countershaft-drive machine is maintained here as is regular standard equipment for complete universal grinding work. This equipment includes one 14-in. and one 12-in. grinding wheel with centers and fenders, wheel-truing fixture with mounted diamond, internal grinding fixture with driving pulley and belt,

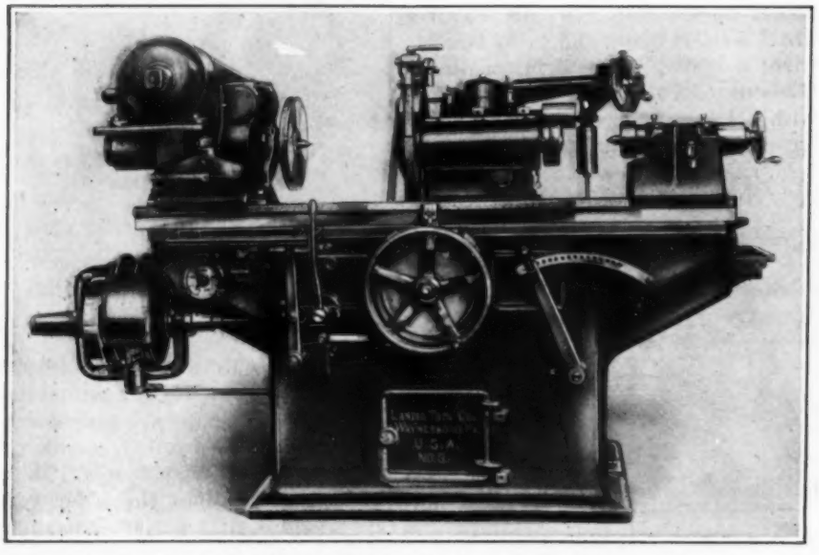


Fig. 1—Landis Self-Contained Universal Grinding Machine

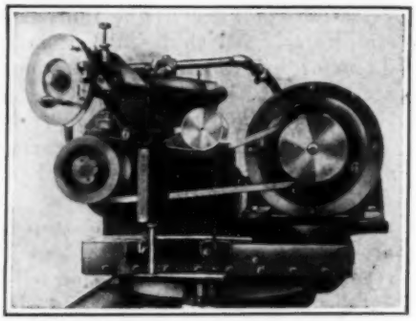


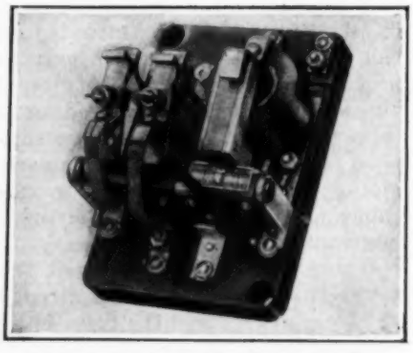
Fig. 2—The wheelhead drive

independent chuck, faceplate, cutter chuck, stationary and traveling cutter tooth rests, set of work drive dogs, complete set of wrenches, necessary work rests, and complete cooling system.

These machines range in weight from 5,600 lb. for the 12x30-in. machine to 7,500 lb. for the 16x60-in. machine.

General Electric Small A. C. Contactors

The General Electric Co., Schenectady, N. Y., announces a small a.c. contactor for general application. The unit is self-contained on a molded base, measuring 6½x4½ in., and provides two main poles rated at 15 amp. with a normally open interlock. This device consumes 3 to 6 watts and can therefore be operated from a 50-watt, bell-ringing transformer.



General Electric Small A.C. Contactor

Among the features of this contactor are a molded shaft of bakelite operating in bronze bearings.

The contactor bears the designation CR-2810-1332 and is made in four forms. Form A is made with a short magnet gap, particularly useful in thermostat control applica-

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tions. The inrush current is said to be reduced to a minimum, thereby decreasing the burning on the thermostat tips and permitting operation through considerable external resistance. This form is limited to 220 volts on the contact tips.

Form B is made with a wider tip gap, and is provided with a barrier between the tips. For 3-phase circuits, it is rated at 2 hp. for 110 and 220 volts, 1½ hp. at 440 volts, and 1 hp. at 550 volts.

Forms C and D are the same as forms A and B, respectively, except that they are back-connected. In this form the unit assembly is retained, but extended screws are used to permit mounting on a base for back-connection.

Blanchard Special Surface Grinder for Asbestos Clutch Facings

THE special grinder for asbestos clutch facings, of either the molded or woven type, was built by the Blanchard Machine Co., Cambridge, Mass., as a modification of its No. 16 high-power surface grinder. The complete machine is shown in Fig. 1, while in Fig. 2 the chucking mechanism is shown.

The work table is of cast iron, fitted with cleats so arranged as to leave pockets to receive the work. A stack of the clutch facings is placed in the vertical magazine, and as the table passes under the pile each set of cleats receives one piece of the work. The work is held down in contact with the table by presser feet, which are stationary but adjustable for different thicknesses of facings. These feet are curved bars seen to the right in back of the pile of work in Fig. 2. They extend from the magazine around to the grinding wheel, and also cover the space inside the grinding wheel, so that the work is held down against the table either by the presser feet or by the grinding wheel throughout its travel. After coming out from under the wheel, the work is discharged from the table by an inclined shoe and guide seen at the left of the magazine. The grinding is done in one pass under the wheel, when about $\frac{1}{64}$ in. of material is removed. As the grinding is performed dry, the waste material is removed by an exhaust system. The wheel and the portion of the table where the grinding is done are completely inclosed by guards so that no dust can escape into the room. The loading and unloading positions, however, are entirely outside of the guard, in full view of the operator. Since the wear of the wheel is slight, it is possible to use a simple hand feed. The magazine is adjustable for facings ranging from 6 to 12 in. in diam. A second magazine can be furnished for handling facings ranging from 3 to 6 in. in diam. Presser feet handle all sizes up to 12 in. in diam. and $\frac{1}{16}$ in. in thickness. The cleats on the table must be changed for any considerable change in diameter of facing, however.

With facings 10 in. in diam. and a removal of 0.015 in. of stock per side, the production is about 1,200 facings per hr. The work is held parallel within 0.002 in. and is held to size within plus or minus 0.002 inch.

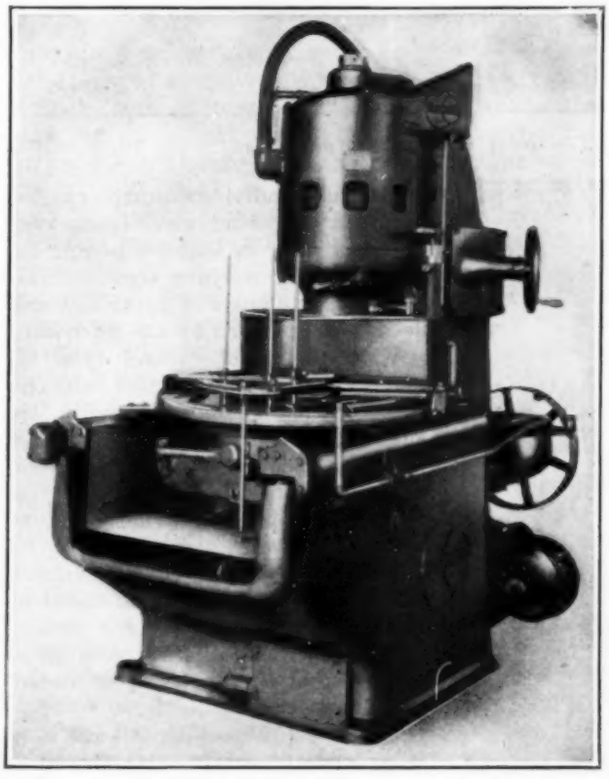


Fig. 1—Blanchard Special Surface Grinder for Asbestos Clutch Facings

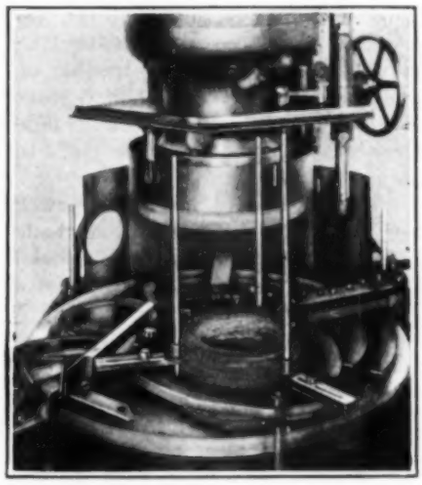
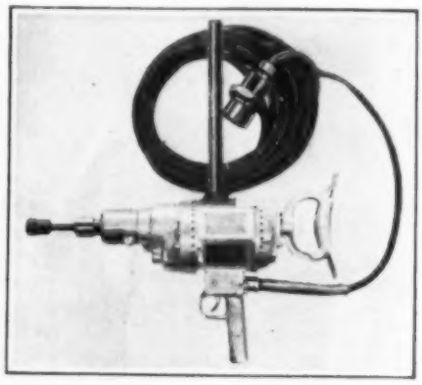


Fig. 2—The holding mechanism

Black & Decker High-Cycle Electric Tools

The Black & Decker Mfg. Co., Towson, Md., has developed a line of "superpower" electric tools driven by 3-phase, squirrel-cage motors operating on 180-cycle current. The motors, being of squirrel cage design, have no commutators or



Black & Decker High-Cycle Electric Socket Wrench

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brushes and it is said that the absence of these parts eliminates the source of most frequent trouble on this type of tool. Another feature of the tool is the rotor, which is made up of copper bars riveted in place in the laminations and welded.

It is possible to get more power per pound in the high-cycle tools than in the universal motor tools. This type of motor also maintains its speed under load and hence has greater productive capacity.

The tools are preferably used in plants where ten or more tools are needed in production work and the supply of current is furnished by the use of either a frequency changer or a high-frequency alternator.

A typical high-cycle socket wrench is shown. A complete line of drills and grinders is also offered.

Rockford Combination Three-Way Boring Machine

THE combination three-way boring machine, with two opposed horizontal heads and one vertical head, shown in the accompanying illustration, was recently developed by the Rockford Drilling Machine Co., Rockford, Ill. In the particular set-up shown nine holes are bored simultaneously in transmission cases, each head containing three spindles.

The drive arrangement for each head is simple and is designed to give considerable power at the drills. The motors are built directly into the heads and drive through worm and worm gears in conjunction with spur pick-off gears for speed variations. These pick-off gears are conveniently changed from the side of the head.

In addition to the speed changes effected with the pick-off gears, there are also available two quick changes of speeds through a lever control. With this arrangement, there are eight gears in the drive proper. All rotating parts are mounted on Timken tapered roller bearings and run in a bath of oil.

The spindles are incorporated in a complete unit that fits to the front of the head proper, but becomes an integral part of it. They are provided with ball thrust bearings and radial bearings on either side of the spindle drive gear or idler, thus assuring alignment and long life. The spindle units are interchangeable in the head proper, so that it is possible to provide for work on a variety of parts through the use of auxiliary spindle units.

In each case the entire head, including the motor, drive, and spindle units, is traversed back and forth on straight ways by means of an Oilgear pump and cylinder. Either hand or automatic control is available, and, depending upon the requirements, individual pumps can be provided or two or more heads can be operated from a single pump. In the particular machine shown, three individual pumps and controls were used, each operated by a 3-hp. motor.

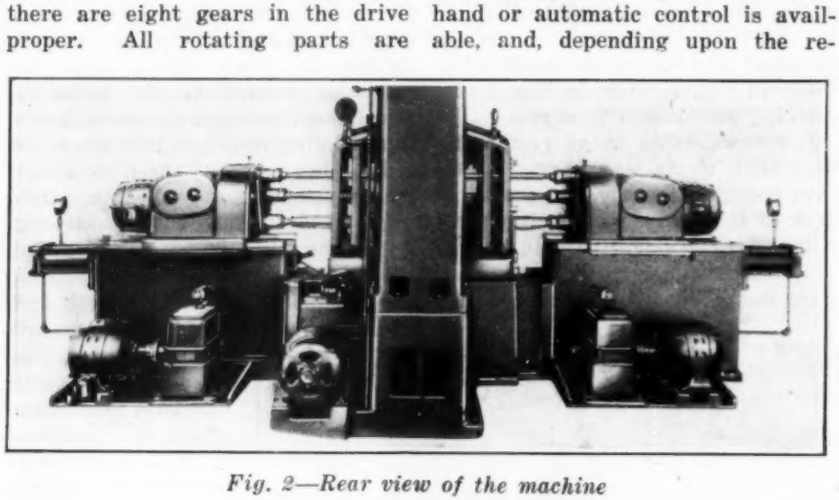


Fig. 2—Rear view of the machine

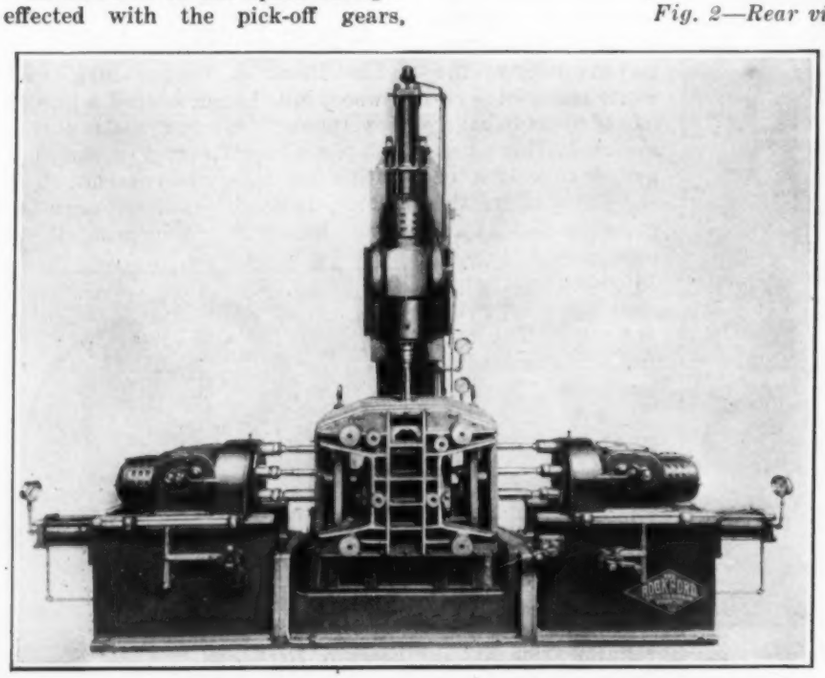


Fig. 1—Rockford Combination Three-Way Boring Machine

With the hand control type of pump, the operator must engage each function desired, while with the automatically controlled pump the operator need only start the rapid advance. For either type of machine automatic stops are provided for forward and reverse traverse.

The fixtures shown on the machine is of this company's manufacture. Arrangements are made for swinging the entire fixture forward on a pivot so that the work can be loaded and clamped conveniently.

This type of machine is built in a large variety of arrangements, such as single-end, double-end and three-way as shown, or three-way with all heads on a horizontal plane.

Shop Equipment News

Langelier Automatic Drilling Units

A RECENT development of the Langelier Manufacturing Co., Arlington, Cranston, R. I., is an automatic drilling unit that can be used for a number of operations such as reaming, hollow milling, facing, counterboring, countersinking, drilling, forming, and tapping (by the use of a reversing tapping chuck). Single- or multiple-spindle heads can be mounted on the feed sleeves.

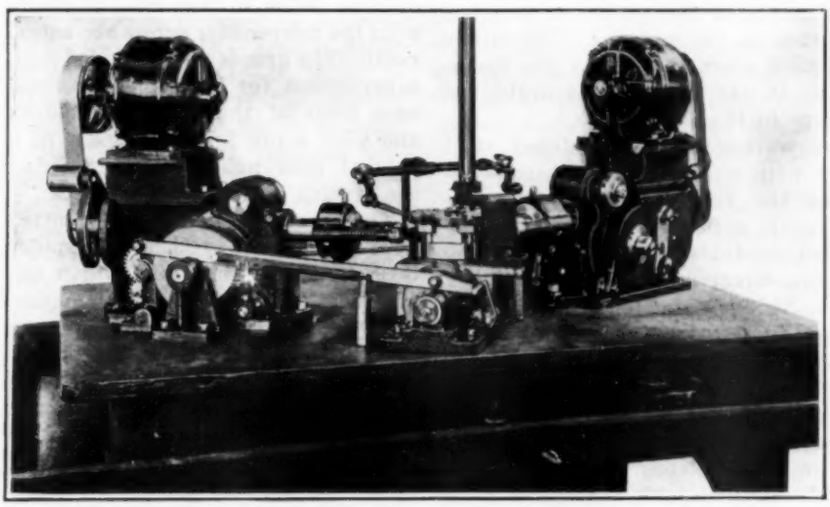


Fig. 1—Langelier Drilling Units mounted on a horizontal bed

The unit can be driven from an individual motor through change gears, or by a belt direct to the spindle. The spindle runs at the same rate of speed as the driving pulley or gear. The feed of the spindle is by a hardened-steel cam driven through a steel worm and bronze worm wheel, and a set of change gears. The cams are cut to give quick advance, feed, pull-out (if required), and quick return, according to the particular operation being performed. The change gears, as well as the feed cams used for obtaining different cycling, are accessible and easily exchanged. Because of this adaptability, the unit can be used in making up special machinery and can be arranged to perform as many as six different operations in conjunction with dial or magazine feeds. In the event that the work for which the machine was tooled becomes obsolete, each automatic unit can be disassembled and used as single-spindle drilling machines, or can be rearranged on the same table to take care of changes in operations or different classes of work.

The shafts in the unit, and also the spindle, which runs on ball bearings, are hardened and ground steel. Once set in motion by releasing the clutch lever, the unit will make a complete cycle and stop at its starting position, or it can be operated continuously by locking the clutch lever in the depressed position. In Fig. 1 the units are shown mounted on a horizontal bed of a special automatic drilling machine. This machine was equipped with magazine and dial feeds for drilling and countersinking gasoline-engine piston pins. In Fig. 2, the units are shown mounted vertically, driven by individual motors and change gears. This particular machine was built for drilling the heads of safety screws. The units are made in three sizes. The No. 11 size will take drills up to $\frac{7}{16}$ in. in steel and counterbores up to $\frac{5}{8}$ in. The feed ranges from 0.003 to 0.01 in. per rev. with a feed travel up to 3 in. Ordinary speeds are 1,400 to 3,750 r.p.m., but by using a high-speed motor, speeds up to 7,500 r.p.m. can be obtained. The working cycles are from 10 to 70 per minute.

The No. 21 unit will take drills up to $\frac{5}{8}$ in. and counterbores up to $\frac{3}{4}$ in. It has feeds ranging from 0.004 to 0.016 in. per rev. and a feed travel up to $3\frac{1}{2}$ in. The normal speeds are from 560 to 2,625 r.p.m. and high speeds up to 5,250 r.p.m. The working cycles are from 5 to 25 per min. The No. 31 unit will take drills up to $\frac{3}{4}$ in. and counterbores up to $1\frac{1}{4}$ in. It has a feed range from 0.005 to 0.02 in. per rev. and a feed travel up to 4 in. The normal speeds are from 280 to 1,000 r.p.m., but a maximum speed of 3,000 can be obtained. The working cycles are from 5 to 20 per minute.

For the three machines the closest center distances obtainable are $8\frac{1}{2}$, 10, and 12 in., respectively. They will operate at any angle without any changes in construction.

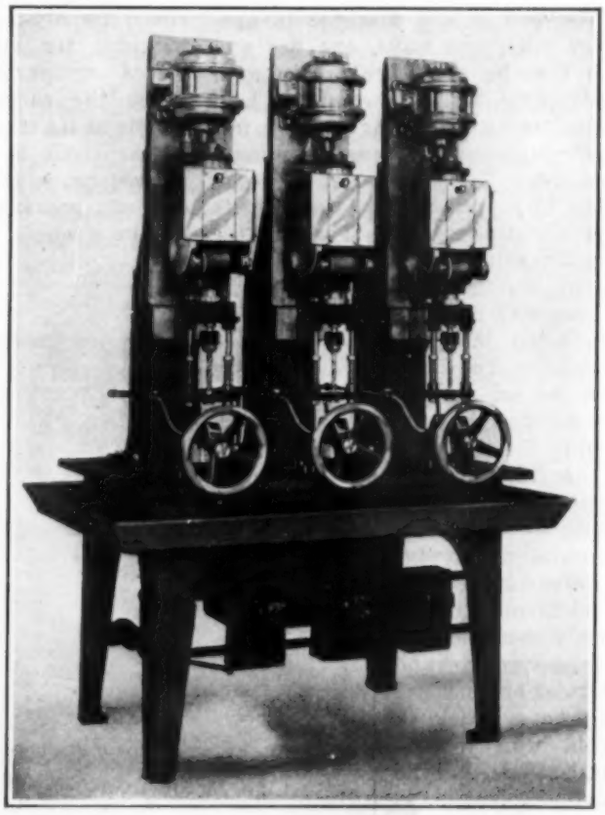


Fig. 2—Langelier Drilling Units used in a vertical position with individual motor drive

Shop Equipment News

Société Genevoise Combined Measuring and Drilling Machine

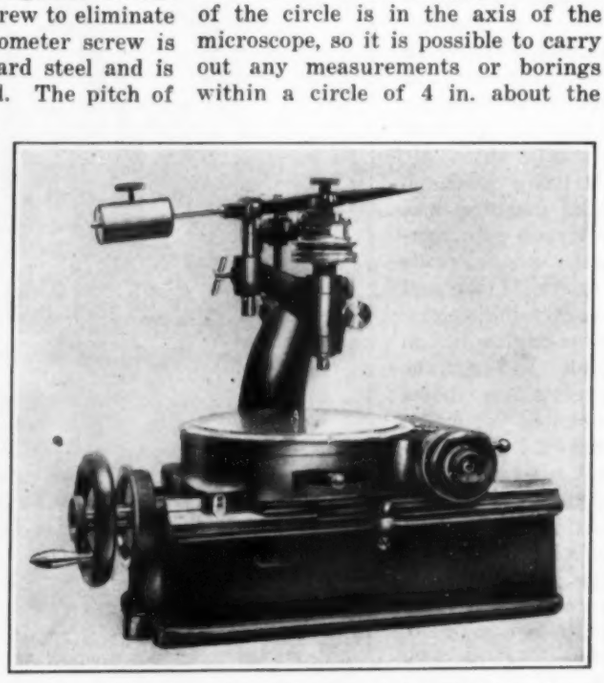
A MACHINE that combines means for accurate measurement with facilities for drilling and boring of holes in master plates or parts of small machines and instruments has been built by the Société Genevoise d'Instruments de Physique of Geneva, Switzerland. It is being marketed in this country by the R. Y. Ferner Co., Investment Bldg., Washington, D. C. Primarily, it is a machine for measurements in polar co-ordinates in that the slide has a circular table with which angular measurements may be made. By means of a table lead screw measurements of length over a range of 4 in. may be made within 0.0002 inch.

A microscope, magnifying twenty-seven times, is used for making the readings and is mounted in the main arm of the machine. When the machine is used for drilling and boring operations a small boring headstock is mounted in the same arm.

The bed of the machine is provided with two ways, one flat and one V-shape, to insure precision in guiding the table. The table is held under spring tension against the nut on the micrometer screw to eliminate backlash. The micrometer screw is made of a special hard steel and is specially heat-treated. The pitch of the screw is 10 th. per in., and the large micrometer drum is graduated into 500 divisions. The drum may be set at zero for any desired position of the slide. It is provided with a large handwheel made of insulating material to prevent the heat of the user's hand from affecting the measuring elements. The drum and its index are inclosed in a heavy shield to avoid injury to the graduations, and the micrometer screw is similarly covered by a metal shield. An arm attached to the nut on the micrometer screw extends toward the bottom of the machine and is held in position and guided by a curved slot cut in accordance with the measurements of the small residual errors of the screw as mounted in place on the machine. The slight rotation given the nut by the variations in the curve compensate for errors in the screw.

A wormscrew of hardened steel and with ground threads also controls the rotation of the circular table. It is fitted with a micrometer drum graduated into 240 divisions, giving direct readings to 30 sec. of arc. This micrometer drum can also be set at zero for each setting and is equipped with an insulated handle. The wormscrew can be released for free rotation of the table. As in the case of the table worm, this wormscrew is completely inclosed.

The circular table is made of hard bronze and is 8 in. in diam. It has a circle graduated in degrees at its rim. Twenty-one tapped holes are provided for attachment of workpieces or parts being measured. When the carriage is set at the middle of its travel range, the center of the circle is in the axis of the microscope, so it is possible to carry out any measurements or borings within a circle of 4 in. about the center of the circular table. A center point, mounted on a spring so that it can be pushed down flush with the surface of the table, is provided for quick centering of work pieces that have a central hole.



Société Genevoise Combined Measuring and Sensitive Drilling Machine

The cast-iron arm for support of the microscope or boring head has been carefully adjusted on the displacement line of the center of the circular table, so that measurements with the micrometer screw are actual radii. The arm is also provided with a projection for receiving the pressure lever of the boring headstock and with a lug for attachment of a pair of idler pulleys for tightening the driving belt of the headstock.

The locating microscope is fitted with a crossed reticle of spider threads, and a rack and pinion are provided for focusing. The microscope can be focused at any point up to 1⅞ in. above the table. It is possible to mount a photographic plate above the table, illuminated by a mirror from below. Glass plates for support of small objects, such as watch wheels, can also be arranged with illumination from below for carrying out various measurements. Special objectives of lower or higher magnifications or for greater working distance can also be furnished, if desired.

The boring headstock is adjustable in height. A sensitive lever, balanced by a counterweight, is used for depressing the drill or end mill through its ½-in. feed. The spindle runs in hardened steel bearings and is arranged for driving by a ¼-in. round belt. It is ½-in. in diam. and carries a 2½-in. pulley. During the drilling operation the table can be clamped to the bed of the machine.

The spindle will take collet chucks up to ¼-in. body and has a boring capacity of holes up to 0.175 in. in diam. The location of the work beneath the tool, for the accurate laying out of the holes to be drilled or bored, can be done by the micrometer screw to the same degree of accuracy as that of the measurements.

The machine is said to be particularly useful in the tool room for checking special gages or for making master plates for small parts. The overall dimensions of the machine are 15x19¼x14¼ in., not including the microscope. Its net weight is 140 pounds.

Shop Equipment News

Badger Leaf-Spring Grinder

THE Badger Tool Co., Beloit, Wis., has modified the construction of its No. 221 double-face grinder for automatically grinding the eyes of leaf springs and bumpers.

The front view of the machine is shown in Fig. 1. Each wheel spindle is driven by a 7½-hp. built-in motor and carries in chucks cylinder grinding wheels, either 16 or 18 in. in diam. The work-carrying member consists of a ram adjustably mounted on two parallel arm castings supported on parallel shafts. The inner or cam shaft is a support for the inner arm, while the outer shaft is connected to the outer arm and imparts the drive to the work-carrying ram.

The cam shaft is driven through worm gearing inclosed in the housing. This unit is shown in the foreground in Fig. 2. The large cam determines the motion of the ram and is removably attached to the outer end of the shaft. An arm and follower roller rigidly attached to the outer end of the driving shaft is held against the cam, which produces a predetermined motion of the ram. The large cam is away from the path of grinding and is in an accessible location so that a cam of different shape can be easily substituted. It is of large dimensions and is claimed to produce a smooth action even at high speed.

The cams are formed to give correct relation between actual grinding time and idling time. During the idling time the ram with its fixture is away from the grinding wheels and at this time the spring is ended around for grinding the eye of the opposite end or a new spring is placed in the fixture. No clamping of the spring is required. The spring eye is laid in hardened V-blocks attached to the inner end of the ram and two adjustable side arms align it centrally with the axis of the spring.

The grinding wheels heads also automatically open and close under the control of two cams, one for each head. Levers and weights return the heads against independent micrometer stop screws. In operation, the grinding wheels are apart as the spring eye enters. The wheels then gradually close down while one or more short passes are being made. When the wheels have advanced up to the stops the spring is drawn out to the idle period. It is claimed that this method of grinding results in high production and at the same time gives increased accuracy and less wheel wear.

The operation of the heads can be timed exactly in relation to the cross travel of the ram and fixture. The speeds can be increased or decreased by merely varying the amount of weights used. Four speeds can be secured from a cone pulley carried on a separate 1-hp. motor. A wheel dresser is provided in front of the wheels.

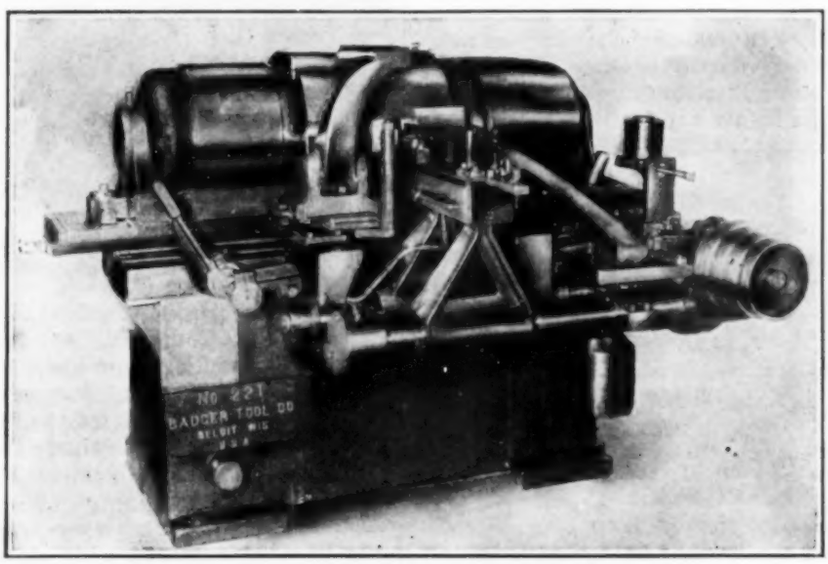


Fig. 1—Badger Leaf-Spring Grinder

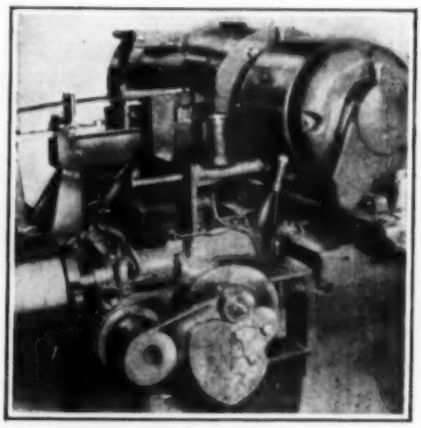


Fig. 2—The work-actuating cam mechanism

The main spindles of the machine are mounted in radial and thrust ball bearings lubricated by grease. All other moving shafts are carried in Timken roller bearings. The entire machine including the slides excepting the main spindle bearing is lubricated with the Bowen "One-Shot" oiling system. All parts are protected against grit but adjustment or easy renewal is also provided.

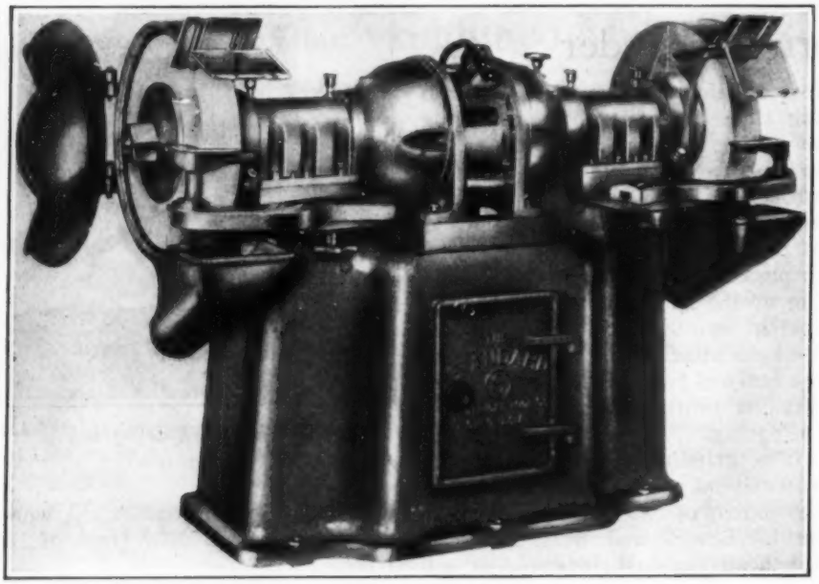
The machine can be furnished in belt drive or with a bracket-type motor drive and can be equipped for either wet or dry grinding. Cylinder wheels up to 20 in. in diam. or disk wheels up to 24 in. in diam. can be used on the machine. The unit shown has a built-in type of motor drive and is arranged for dry grinding. As such the entire equipment weighs 6,000 lb. and occupies a floor space of 6x8 feet.

Standard Electrical Tool Co. Heavy-Duty Grinder

The heavy-duty electrically-driven grinder, illustrated, has been added to the line of similar equipment put out by the Standard Electrical Tool Co., Cincinnati, Ohio. The machine is made in three sizes of 5,- 7½- and 10-hp. capacity.

The 5-hp. grinder carries two wheels, 18 in. in diam. with 3-in. face, and weighs 1,920 lb. The 7½-hp. grinder carries wheel 24 in. in diam. by 4-in. face and weighs 2,020 lb. The 10-hp. grinder carries

Shop Equipment News



Standard Electrical Tool Co. Heavy-Duty Grinder

wheels 24 in. in diam. by 4¾-in. face and has a weight of 2,375 pounds.

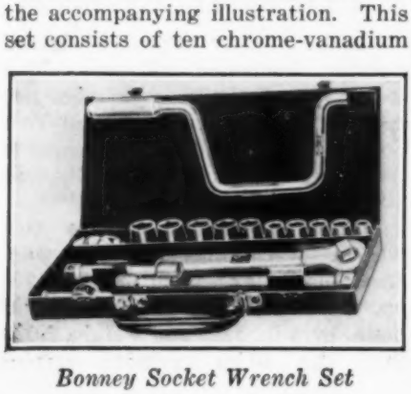
The grinders are equipped with 40-deg. General Electric motors, having push-button control. Four SKF deep-groove ball bearings are used to support the spindle. The bearings are incased in dust proof chambers, and the armature shafts that they carry are made of high-grade nickel steel. A locking device is provided, to hold the shaft when changing wheels.

The emery wheel guards are of heavy construction and are of the hinge door type with exhaust connections. Each guard is fitted with a spark breaker as well as a polished, wired-glass eye shield.

Bonney Socket Wrench Set

The Bonney Forge & Tool Works, Allentown, Pa., has brought out another socket wrench set, shown in the accompanying illustration. This set consists of ten chrome-vanadium steel hexagon sockets ranging from $\frac{7}{16}$ to $\frac{7}{8}$ in., inclusive, and three handles: Ratchet, sliding T, and 13-in. brace handle, the last of the so-called speeder type. Two extensions, 5 and 10 in. long, and a universal joint are also furnished.

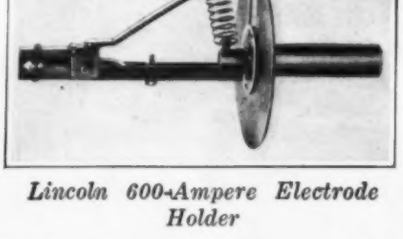
The entire outfit is packed in a substantial black enameled carrying case with leather handle. These wrenches are guaranteed to be stronger than the nut or bolt that they fit.



Bonney Socket Wrench Set

Lincoln 600-Ampere Electrode Holder

The accompanying illustration shows a 600-amp. metal electrode holder recently brought out by the Lincoln Electric Co., Cleveland, Ohio. This holder handles metal electrodes in sizes up to ½ in. in diam. and is known as type TR.



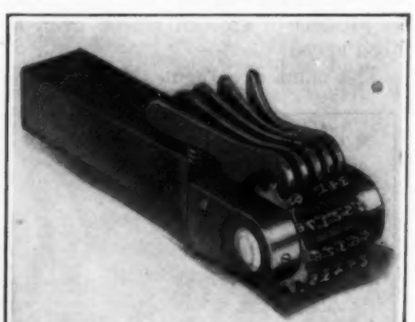
Lincoln 600-Ampere Electrode Holder

Many improvements are claimed for the holder, among them being: Replacable copper jaws, giving four lines of contact on the electrode and an all-copper path for the welding current; structural steel construction of maximum strength; light weight with good balance; an insulated and ventilated handle, and shield for protection of the operator's hand. These features are said to be of importance in handling the heavy currents now common in manual welding practice with metal electrodes.

Noble & Westbrook Hand Numbering Device

The Noble & Westbrook Manufacturing Co., Hartford, Conn., has added to its line the hand numbering device shown in the accompanying illustration. It is intended for the purpose of stamping a complete number upon any given article instead of using separate stamps, with the attendant possibility of ragged alignment. By setting the several numbering wheels to bring the requisite numerals in line the entire number is imprinted by one blow of the hammer or mallet.

Each numbering wheel ordinarily carries the ten digits from 0 to 9 and has one blank space, so that the number to be stamped may be continuous or it may consist of two or more shorter numbers in line with space between. Special wheels with any ten letters of the alphabet may be furnished if desired, or the stamps may comprise short logotype names when so ordered. Any reasonable number of wheels may be included in the frame. The wheels are located and held in alignment by latch levers.



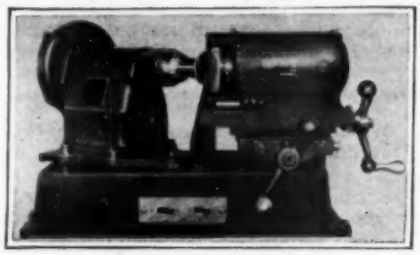
Noble & Westbrook Hand Numbering Device

The frame and latch-levers are made of a heat-treated alloy steel. The material of which the wheels are made is a high-grade tool steel.

Shop Equipment News

Black & Decker ½-Inch Universal Valve Refacer

The ½-in. universal valve refacer illustrated was recently placed on the market by the Black & Decker Manufacturing Co., Towson, Md. It resembles the No. 45 valve refacer, which was described on page 889, Vol. 65, of the *American Machinist*, except that the work head on the new machine is mounted so that it can be set to any desired angle. There are sockets located at 30,- 45- and 60-deg. points into which a tapered plug drops in order to definitely locate the head when grinding at these particular angles without loss of time.



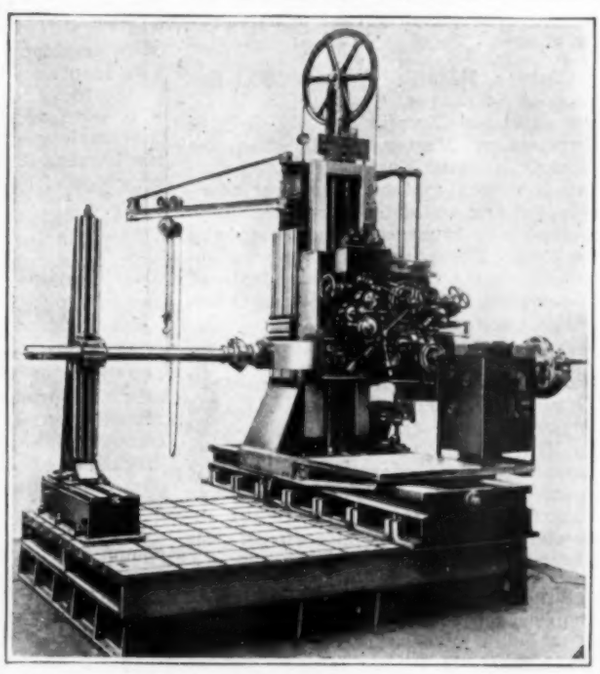
Black & Decker ½-Inch Universal Valve Refacer

The machine will reface valves with stems up to ½ in. in diam. Both motors are of the universal type and can be supplied for all voltages.

Morton 60-Inch Stroke, Draw-Cut, Traveling Head Planer

THE 60-in. stroke, draw-cut, traveling head planer illustrated has been brought out by the Morton Manufacturing Co., Muskegon Heights, Mich., for planing, milling, boring and drilling operations. It is equipped with reversing motor drive. The machine has a horizontal travel of 9 ft. on the base, a vertical travel of 5 ft. on the column and a travel of 5 ft. on the cutting stroke. It can be furnished with any length of bed or height of column, and either with or without the boring, milling and drilling attachments. The bottom of the bed is planed so that the machine can be used either as a stationary or portable machine. It can also be quickly changed into a push-cut unit, thus making it a traveling-head slotter. The milling and boring feeds are automatic and can be easily and rapidly changed. The feed gear box has eight changes in each direction, giving a range suitable for most boring and milling operations. A hollow steel arbor passes through the ram and is bored for receiving taper milling cutters, boring bars and other special equipment. When planing or shaping, the machine will automatically feed horizontally on the bed or vertically on the column.

With the reversing motor drive, the power is transmitted through miter gearing through a vertical shaft to the operating mechanism contained in the apron. This construction eliminates the reversing clutches necessary with other drives.



Morton 60-Inch Stroke, Draw-Cut, Traveling Head Planer

These traveling-head planers are said to be especially adapted for the complete machining of large rolling mill housings, engine beds, air compressor and refrigeration castings, and the like, where a number of operations must be performed on a single large piece.

Boston Adjustable Outboard Bearings

The Boston Gear Works Sales Co., Norfolk Downs (Quincy), Mass., has put out a line of adjustable outboard bearings with bushing bores ranging from ½ to 2¼ in. in diam. Without the bronze bushing, the bores range from ¾ to 2⅜ inch.

The units are of sturdy construction and are said to be durable. Boston duplex bearings can be used to advantage in these adjustable supports.

The overall heights vary from 5⅛ to 12⅜ in., the base dimensions from

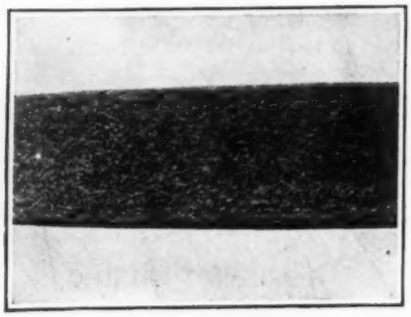
Boston Adjustable Outboard Bearing

2⅝x4½ to 5¼x10⅜ in., the maximum base-to-center distance from 4¼ to 10⅜ in., and the minimum from 1⅞ to 4¼ in. The weights vary from 2¼ to 28 pounds.

Norton High-Speed Snagging Wheel

The Norton Co., Worcester, Mass., has developed a grinding wheel for snagging. Bakelite is used as the bonding material and the wheel is designed especially for high-speed operation up to a surface speed 9,000 ft. per min. It is said that the use of Bakelite results in a wheel

Shop Equipment News



Section of a Norton High-Speed Snagging Wheel

with the open structure of a vitrified wheel, but one that can be operated with safety at high speed. The structure can be seen in the accompanying photograph.

It is also claimed that the Bakelite bond is not affected by heat and that due to the high speed a considerable increase in production can be obtained.

Trade Catalogs

Bearings, Ball. The Standard Steel and Bearings, Inc., Plainville, Conn., has issued a new set of data sheets containing load and speed ratings, as well as other engineering data.

Brass. The Mueller Brass Co., Port Huron, Mich., has published an illustrated circular on brass fittings for electric refrigerators, including a shut-off valve, elbows, tees and couplings. The illustrations are attractively arranged.

Furnaces, Electric. The Automatic & Electric Furnaces, Ltd., 173 Farringdon Rd., London, E. C. 1, England, has issued Heat-Treatment Bulletin No. 38, entitled "The Correct Hardening of Tool Steel," by A. R. Page. The results of some practical experiments are explained. The pamphlet is illustrated by one chart.

Stainless Steel. The Carpenter Steel Company, Reading, Pa., has issued a 52-page catalog on its stainless steel. The effect of carbon and chromium in the steel is first explained with particular reference to the critical content range of chromium. The effect of scale is also indicated and the factors affecting corrosion explained. For each type of stainless steel, instruction in forging and heat-treating is given and complete physical properties are enumerated. The catalog is illustrated with numerous examples of stainless steel objects.

Welding Pipe Lines. The Linde Air Products Co., 30 East 42nd St., N. Y., has issued a booklet describing its accomplishments in welding oil and gas pipe lines. The text is attractively arranged and is well illustrated throughout. It indicates some of the difficulties encountered in this type of work, and the methods used to overcome them.

Welding. The Lincoln Electric Co., Cleveland, Ohio, has published a 36-page booklet entitled "Modern Manufacturing with 'Stable-Arc' Welder." It shows how castings can be replaced by standard rolled-steel sections joined by arc welding in regular manufacturing. Numerous illustrations enhance the text, which includes instruction in the new designs made possible by this method of manufacturing. Various types of welding equipment made by this company are also presented.

Pamphlets Received

"Foreign Agency Agreements." The American Foreign Credit Underwriters, Inc., 381 Fourth Ave., N. Y., have issued a 20-page pamphlet under the above title by William G. Marvin. The pitfalls of doing business abroad through agents are carefully considered in this booklet and sound advice is given on how to avoid them. The essentials of a sound agreement are stated clearly and advice is also given on the general subject of foreign sales through foreign agencies.

Foreign Patents. The American Manufacturers Export Association, 233 Broadway, N. Y., has published a 13-page pamphlet entitled "Foreign Patents for American Inventions: A Revaluation." The whole foreign patent situation is first considered in a general way and then is taken up specifically by countries. A review of the industrial situation abroad is necessarily included.

Gaskets, Metallic-Encased. The Bureau of Standards, Washington, D. C., has published Circular No. 336 on U. S. Government Master Specification for Metallic-Encased Gaskets. The specification covers material and workmanship, general and detailed requirements, method of inspection and test, and packing. The publication may be obtained from the Superintendent of Documents, Government Printing Office, Washington, for 5 cents.

Prevention of Blindness. The National Committee for the Prevention of Blindness, 370 Seventh Ave., N. Y., has reviewed its work during 1926 in its twelfth annual report. Part of the pamphlet, which contains 32 pages, is devoted to the elimination of eye hazards in industry. The report indicates an increased interest in this phase of welfare work.

Payment of Wages by Check. The Department of Manufacture, Chamber of Commerce of the United States, Washington, D. C., has issued a special pamphlet on the above subject. In it are summarized the results of an investigation made to determine the feasibility of this method of wage payment. The study was influenced largely by the increase in payroll robberies. Various types of check systems in use by large concerns are analyzed and various difficulties and advantages discussed.

Purchasing Agent. The Policyholders' Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., N. Y., has published the seventh review of its Business Organization series, entitled "Functions of the Purchasing Agent." The booklet contains 16 pages divided into three sections: Place of the purchasing agent in the organization, his duties, and the problems with which he is faced. The material was gathered from the actual experiences of thirty organizations throughout the country. The booklet is illustrated with purchasing organization charts of various companies.

Mutual Aid Societies Must Pay Tax

Large employers of labor throughout the United States, whose companies operate "Mutual Benefit Associations" for their workers, will be interested in a ruling just handed down by the income tax division of the Internal Revenue Bureau. This ruling places such associations in the same category with commercial life insurance companies and subjects them to Federal income tax. They are required to report their income from interest, dividends and rents, and are allowed only the deductions to which a life insurance company is entitled.

The Phoenix Mutual Benefit Association is the particular one around which the question arose. This association was organized some years ago for the office employes of the Phoenix Mutual Life Insurance Co., of Hartford.

According to Albert H. Yost, counsel, it is the Government's contention that the employees' organization must pay tax because it is not exempt under any provision of Section 231 of the Revenue Law.

Committee Recommends Iron Research

At a meeting of the committee on cast iron of the American Foundrymen's Association, held at Philadelphia recently, it was recommended that a complete bibliography of the existing literature of cast iron, including foreign publications, be prepared and used as a basis for a research program.

In addition to the above activity, the committee is endeavoring to complete arrangements for an immediate investigation of effect of the use of borings and turnings in blast furnaces on the quality of pig iron. This investigation was discussed at the conference on pig iron qualities held at the Chicago convention of the American Foundrymen's Association, recently.

NEWS OF THE WEEK

Italy Places Hope of Future Prosperity in Hands of Ministry of Corporations

Mussolini promises rejuvenation in 10 years

By Edward J. Mehren
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IN A FAMOUS address in the Scala Theater, in Milan, some years ago, Mussolini thus epitomized his theory of government—"All within the State, nothing against the State, nothing outside the State." If the doctrine were to become more than abstract theory, industry was bound sooner or later to receive the Duce's attention. Its turn came last year. The result has been the federation of all producers—and not merely industry—into three great "unions," one for the employers, one for the employees, and one for the professional classes. The merchants and the bankers necessary to the productive function, are also included. The entire organization heads up in the cabinet, in a "ministry of corporations," and at present Mussolini holds that portfolio among his many others.

Three Confederations

Under the ministry of corporations come the three great unions of confederations. The union of confederations of employers and the similar union of employees—both have six constituent confederations—for industry, agriculture, commerce, maritime and aerial transportation, land and internal waterway transport, and banking. Each of these confederations, in turn is made of national syndicates of important industries, resembling our industrial and trade associations. For example, the Confederation of Industry has six constituent syndicates, namely, for chemicals, silk, cotton, the mechanical industries, the metallurgical industries, and miscellaneous industries. The land and internal waterways confederation is divided into four groups: railroads, motor transport, internal navigation, miscellaneous agencies.

In order that all interested in one line of industry, trade or agriculture may come together there is also a cross liaison, through a group of "corporations," in which employer, employee and technical group syndicates may get together.

In all these unions, confederations and syndicates, the directing officials are appointed by the ministry, but selected from the group in question. In each provincial town, where the numbers warrant, there is also a secretary for each syndicate, and he appoints a committee that has charge of the activities of the syndicate branch in the province.

Among the engineers, for example, the Associazione Nazionale Ingegneri, the former Italian national engineering society, has become by law the Sindacata Nazionale Ingegneri, and its officers are no longer elected by the members, but appointed by the ministry of corporations. Quite naturally the men prominent in such organizations before, are prominent in the local branches now.

One of the provisions of the law governing these organizations is that there may be neither strikes nor lockouts. Mediation must be tried first; if that fails, the controversy goes to an arbitral body whose decree is final and binding. Neither after the decision nor during the proceedings may there be a cessation of work due to the efforts of either party.

It is plain, therefore, that all productive forces of the country are under close control, and that an industrial, agricultural, commercial or banking policy, decided upon in Rome can quickly be put into effect. This explains the present unanimity in the reduction of industrial wages.

Aside from the administrative functions which naturally fall to the confederations and syndicates, Mussolini plans for his organization of producers a parliamentary function. He has announced that the present lower house of parliament selected on a territorial basis is to be discontinued and that in its stead will be a house made up of delegates from these confederations. The present session is to be the last of the old type of parliament. Presumably, the delegates to the new house will be appointed by the ministry, and not elected by the members of these bodies. The senate will remain as now.

In an address made by Mussolini on the opening of parliament on May 26, the most striking features appeared promptly in the American press. But certain points will bear repeating. The address had been awaited for some time, for the Premier makes fewer speeches now than formerly. It was a report on the "state of the nation" as we would call it.

Probably his most interesting statement was that he still had from 10 to 15 years of work ahead. He used the words, "for my successor has not yet been born." That remark, though, is interpreted here to mean that his successor will be such a young man that he is not yet in political life. In any event, he gave clear notice that he has no present intention of relinquishing his leadership.

On the political side, he was caustic regarding the "evaporation" of the Locarno spirit, claiming that the nations there assembled were again in an armament race. Here he rattled the sword. Italy must be in a position to make itself felt when the crucial time of arms comes; between 1935 and 1940 she would be in a position to assert her position.

He pointed out that Italy in 1950 would, at the present rate of increase, have a population of 60,000,000, which must be provided for by land development and industrial growth. Since population is a factor in military strength, the growth should be assisted by assistance to mothers and children, the funds coming from taxation on unmarried people and childless couples.

Condemns Public Utilities

He condemned municipal ownership of utilities, which is in harmony with his action of selling the telephone systen of Italy to private interests some years ago.

Finally, he predicted that in 10 years one would not recognize Italy for she would have changed fundamentally her countenance and her soul.

Of course, one cannot but form some idea as to the wisdom of the régime as a whole. One cannot, of course, expect people that one meets for only an hour to enter into a full and frank discussion of the subject. The Fascists themselves make no secret of the quick way in which they deal with opposition; "nothing against the State" is the doctrine. What one sees and hears, then, are the surface things.

Outwardly everything looks well. The country is prosperous; the people look and dress well, and appear confident. There is no doubt that the method works, and when one expresses doubt as to its wisdom the answer comes quick that no other régime would have been adequate for Italy's needs at the time; and this statement is made with evident conviction by men of affairs.

If Mussolini remains in control, Italy is sure for the next decade to be one of the world's interesting social studies. Today, outside of Italy, there is general criticism of his methods. What, though, may come out of his organization of a nation along functional rather than territorial lines? Loyalties are commonly believed to attach themselves to the soil; hence territorial representation in government. But is the idea

This article was written especially for *American Machinist* by Edward J. Mehren, who is traveling in Europe for the purpose of making industrial surveys of several countries. Other articles will appear in future issues.

sound? Is America a series of land parcels or a spirit, an ensemble of ideas, aspirations, principles? Certainly that which determines our well-being and our social outlook today is largely the occupation in which we are engaged. Is Mussolini's conception more in harmony with present day industrialism than is territorial representation? Be it recalled that a chamber of commerce, advisory to our Congress was long ago suggested. In Germany there is the Reichswirtschaftsrat—a council of representatives of employers, employees and the public which must report to the Reichstag on all economic legislation proposed in that body. In England we have the Labor Party—an effort to get functional representation in government. Again, the pulling and hauling—the lobbying—of labor and of capital in our own Congressional and legislative corridors is but another evidence of the demand of the functions of society for recognition.

Has Mussolini hit on something that will be adopted into industrialized countries in the future? Obviously, his experiment would be more significant if the new house of parliament were freely selected and had liberty of action. Nevertheless, there is here an idea of importance—a deliberate adoption into government of functional representation, and a more thorough one than the German experiment. Despite its limitations this plan is well worth watching.

Finally, one can readily believe, after a brief visit, that if Mussolini runs Italy for 10 years more, it will have a new countenance and a new soul. What will come then no one can tell; possibly disorder, possibly gradual and peaceable re-democratization.

Tariff Revision in France Must Come Before Money Stabilization

Influence of the Geneva Economic Conference

By Our Paris Correspondent

STABILIZATION and revalorization of the franc are still the paramount topics in France, but it seems unlikely that any further steps will be taken until the tariff revision problem is solved. This latter has been made difficult as a result of the general conclusions arrived at by the Geneva Economic Conference just closed, where those of the delegates of the forty-seven assembled nations who committed themselves at all were avowedly in favor of abolishing tariffs as far as might be possible, at least lowering them and doing away with all restrictions and prohibitions affecting both imports and exports. Such a proceedure would be of inestimable value to France hence tariff discussion within the country at this time is bound to be regarded unfavorably by other nations.

It is generally conceded that sales prices on most metallurgical and fabricated metal products are below those of the pre-war period, taking into consideration the franc value of four cents today as against nineteen cents formerly.

There is an element in France which believes that there is a big potential Russian market awaiting now that the split has come between Great Britain and the Soviet Republics, though it is admitted that Germany and Czecho-Slovakia are already on the threshold of the gateway opening to the East.

The French engineering industry is of very wide scope, the quasi-official statistics which were presented to the Geneva conference including, apart from motor car construction, the enormously important manufacture of bicycles and even of freight and passenger cars, and other trades still farther removed from the dictionary definition.

Production is estimated as of a value of six billion paper francs ($240,000,000) per annum. Output is estimated as at 12,500 francs paper per head, which is claimed by the representative of the Deutscher Maschinenbau Anstalten as being but a third of the value of the output of the German worker in like industries. Taking the metallurgical and metal transforming trades as a whole, France claims a million workers.

It is certain that the interior metal trades are showing the same effects as that of export, and for the same reasons a tendency is observed to drive with a slack rein. Fabricators of most standard metals are unable to get deliveries of raw or semi-raw materials under a month or six weeks.

The significance of the falling off in the imports of materials necessary for industry during the first four months of 1927 is apparent. These depreciated nearly three billion francs for the period; just so much less raw material to be worked up in France, implying a probably reduced home consumption and ultimately a consequently lesser export of manufactured articles. During the same period exports of manufactured articles fell off to the value of 70 million francs.

A recensusing of some of the important railway repair shops has shown that that of the Chemin de Fer du Nord has its equipment of machine tools made up largely of units of French manufacture. This is a singularly apparent indication of a disposition to support the home market today, whereas in the past the bulk of modern machinery was, without question, of American or German manufacture.

The Foire de Paris, just closed, demonstrated once again the progress that France has made since the war in machine tool construction in all its phases. Still, prices remain high by reason of limited output and costly overhead and, of course, the restricted home market; while in the export field there is still to be met the predominant American, British and German competition.

The automobile industry is still depending upon export business for its figures on the right side of the balance sheet and, contrary to expectations, the first four months exports of the year showed 15,895 units as compared with 16,219 units during the same period last year, though the values were then in excess of those of the present term by nearly a quarter of a billion francs. This situation, somewhat surprising on the whole, shows about the only brilliant spot in the industry.

M. Andre Citroen has been elected president of the Syndical Chamber of Automobile Manufacturers and as a word of warning has urged the government to go slow in adopting an abnormal tariff revision for fear of repurcussion in the French export market. It should be mentioned that the Citroen company now has plants in operation in France, Germany, Italy and England and is in a better position for warding off undue competition than others in the French industry.

Living costs are by no means diminishing to an extent that they are noticable and are accordingly giving concern to employers and employees alike. Employers fear an increased wage demand —which for output is probably already greater than in any other of the industrial nations—and the employees fear that it won't be granted. Production costs on fabricated iron and steel goods, in which wages form so high a percentage of cost, are now about all that the majority of items can stand and hold off excessive imports of goods from abroad.

Wages in the metallurgical industries, so far as the higher skilled labor is concerned, have not kept pace with living costs, but with certain other classes of metal workers the discrepancy is less apparent. The margin, however, is not considered sufficient for the acquisition of a living standard of the times. In the Bellegarde district in mid-eastern France metal workers have had their wage increased 35 per cent since 1925 but this does not cover the advanced living costs of the period. In the Eastern metallurgical district the general index of living costs stands at Nancy at 516 while at Metz, barely thirty miles way, the index is 607.

Machinery Trade Dull

The machinery trade is dull. Various manufactured metal goods are undergoing fluctuation in price in order to find a level which will command business. Galvanized tubing is offered by jobbers at less than the figures quoted by manufacturers, implying heavy stocks on hand and limited demand. A general improvement is remarked in building hardware lines. Machine wire has more than held its own among exports which increased during the first four months of 1927. Bolts and nuts are due for a rise in price owing to production costs being steadily on the rise. Black and galvanized sheets for the automobile industry are finding even less demand than was expected and competition has a tendency to lower prices. There is little activity in rolling stock plants beyond that already developed from business which came to hand since the first of the year.

European Aero Companies Plan New Lines

Additional air lines are reported for France, Sweden, Poland, Italy, Germany, Spain and Switzerland. The French have extended two lines across the Mediterranean to the north coast of Africa, and a Spanish line between Madrid and Seville via Lisbon has just been reported. In Germany, aside from local lines, an international line between Vienna and Malmo via Prague, Dresden, Berlin, Lubeck and Copenhagen is contemplated.

Airplane transportation companies in Europe are said to be providing better lighting and communication services and improved facilities at airports for the protection and comfort of passengers. New aircraft have been added in many instances and these have additional devices for increasing the safety and reliability of the machines.

European governments subsidize their air services from one-half to nine-tenths or more of the operating costs. They also provide terminal facilities, lighting, weather reports, loans for the purchase of new equipment, freedom from taxes and many other indirect aids.

The operating companies are reported to be reducing operating costs, increasing efficiency and business, and generally improving their financial conditions. The Royal Air Service Co., Holland, for example, has an excellent record of safety and regularity with its three-motored craft and has reduced its deficits. Its operating cost per ton-mile was reduced from $1.84 in 1920 to 54 cents in 1926 and further reductions to 24 cents are expected.

The movement toward co-operative effort between companies of different nationalities is progressing steadily. Two Swiss companies exchange passengers with the Imperial Airways, Ltd., which serves between London, Paris, Basel and Zurich, and with the French Air Union, which connects Geneva with Paris and Marseilles via Lyons. The Basel Air Service Co., in connection with the Royal Aviation Co. of Holland, has started a joint service between Basel and Amsterdam via Brussels and Rotterdam. Plans are underway for a Swiss company to form a link in the service to be provided by several companies between German and Spanish cities and ultimately to be extended to South American countries.

The Vienna-Venice service is provided by the Austrian Air Service Co. and the Transadriatica Co. (Italian), whose planes alternate. The Vienna-Prague-Berlin-Malmo service mentioned above is provided by the united effort of Swedish, German, Czechoslovakian and Austrian companies. The Paris-Berlin service via Cologne and Essen is operated jointly by the General Air Transport Co. (French) and the Lufthansa Co. (German).

Postal authorities in several countries are providing additional arrangements for the exchange of mail and parcel post over the several air lines. Rates are quoted for parcel post packages from Marseilles, for instance, to several important centers in northern Europe.

Insurance rates are placed as low as possible and in many instances are lower than those offered by other means of transportation. The favorable rates quoted on shipments by air are said to be made possible by the greater security of air shipments. One large company makes a practice of insuring its passengers without additional cost.

The latest records of the companies show few accidents and regular service.

Merchant Marine Losing Strength

The American merchant marine has declined 7½ per cent in tonnage since 1920, according to an analysis made by the National Industrial Conference Board. While the total world tonnage of merchant ships has increased 16 per cent during the last six years, the gross tonnage of merchantmen sailing under the Stars and Stripes has decreased from 12,406,123 gross tons in 1920 to 11,472,824 tons in 1926. Despite this decline, the United States still holds its place as the second most important maritime nation.

Germany, having lost nearly all, or about nine-tenths, of her merchant marine through the war, again looms as the fastest growing maritime nation, her merchant marine having increased 630 per cent in gross tonnage from 1920 to 1926. At that, while she has built or repurchased ships totaling 2,642,657 gross tons since 1920, she has recovered only about three-fifths of her pre-war strength. Italy and Japan follow next in order as regards the rapidity with which they are increasing their mercantile marine. France comes next, with an increase of 12.2 per cent. The British merchant fleet continues to lead in total tonnage, but shows only 7.7 per cent increase for the six years.

Trans-Atlantic Flights Stimulate Orders for Planes

That the recent flights of Lindbergh and Chamberlin were of direct trade promotional value is indicated by the fact that in the space of three days the Automotive Division of the Department of Commerce has received cabled inquiries from Germany and from Argentina relative to the purchase of duplicates of the planes used in the respective flights.

The inquiry from Argentina stated that money had been raised to finance a flight across the South Atlantic via Brazil and Dahar, Senegal, Africa. For this trip it is proposed to use an American plane and quotations were asked C.I.F., Buenos Aires, on the same types as were used by the two American trans-oceanic flyers. These quotations were furnished within twenty-four hours after receipt of the inquiry.

In connection with Argentine aviation, it is pointed out by the Automotive Division that the President of the Republic on June 10th requested congressional authorization to spend $1,605,000 for aviation.

A.S.T.M. Holds Annual Meeting

The thirtieth annual meeting of the American Society for Testing Materials, which also marked the twenty-fifth anniversary of the incorporation of the society, was held June 20 to 24 at the French Lick Springs Hotel, French Lick, Ind. The past year has been a busy one for the society, and there was a large amount of business to be considered in the limited period of time allotted.

Registration opened on Monday. The afternoon and evening were devoted to committee meetings. Tuesday morning was also devoted to committee meetings. In the afternoon and evening four sessions were held. Opening remarks were made at the general session by J. H. Gibboney, president of the society. At the second session, committee reports and papers were submitted on the subjects of wrought iron, cast iron, and magnetic testing. The third session considered rubber, textiles, coal and timber. The fourth session, which was featured by a presidential address, entertained the reports of the executive committee and the committee on testing and nomenclature.

On Wednesday the fifth session on steel and the sixth session on petroleum products, insulating materials and preservative coatings were held. The early afternoon was given over to recreation and committee meetings. Later the second Edgar Marburg lecture, "X-Rays in Industry," was delivered by Dr. George L. Clark. This lecture is an annual feature, for the promotion of knowledge of engineering materials, commemorating Dr. Edgar Marburg who was secretary-treasurer of the society from its incorporation until his death in 1918. The twenty-fifth anniversary dinner, followed by an informal dance and smoker, was the program for the evening.

The eighth session, on corrosion, endurance, and wear testing of metals, was held on Thursday. Committee meetings occupied the afternoon. In the evening the ninth session on non-ferrous metals and metallography, and the tenth session on clay and concrete products and building stone were held. The eleventh session on cement, lime and gypsum was held on Friday morning as was the twelfth session on road materials and waterproofing. Golf and tennis tournaments featured the recreation program of the afternoon.

Safe Aircraft Competion

The administrators of the Daniel Guggenheim Fund for the Promotion of Aeronautics have drawn up a set of rules for a contest on safety in aircraft. The object is to remove the skepticism of the average citizen regarding the use of airplanes for him, or her. The fund offers a first prize of $100,000 and five prizes of $10,000 each in accordance with a set of rules drawn up by a committee of experts. The entrants are not limited to any country. The tests include safety, landing and take off in restricted areas, minimum flying speeds, stability, control in case of engine failure and carrying capacity.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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"IN 1914 there were 11,385,734 individual savings bank depositors. In 1926, the figures had grown to 46,752,240. In 1914 there was a total of $8,712,000,000 on deposit in savings banks. In 1926 there was $24,696,000,000. According to the National Bureau of Economic Research, the growth in 'National income' has been from $33,000,0000,000 in 1914 to a 'current income' of $89,680,000,000 in 1926."

The foregoing paragraph is printed from time to time in many American papers and magazines. It explains the wide-spread optimism that now pervades the United States, and the resiliency of the stock market, which was only momentarily affected last week when the Federal Reserve Board announced that brokers' loans in the New York District had risen to $3,160,000,000, which is about $19,000,000 above the record of $3,141,000,000 attained in January, 1926. It had been generally expected that stocks would decline upon this announcement, but the fears of speculators appeared to be allayed when someone explained that the increased borrowings were being chiefly used to carry undigested securities that were still in the hands of underwriting bankers, and those who had come downtown to sell were dissuaded from letting their holdings go. The effect of the announced increase was, therefore, negative rather than positive, and although the market showed a declining tendency toward the end of the week, the liquidation was normal and orderly.

But the other side of the picture is revealed by the action of the Knit Goods Association, whose members have voted to add no new machinery to their existing equipment for the present. It is explained that the producing capacity of the machinery already installed is well in excess of the current demand, and that an increase in the output would only have the effect of reducing prices without increasing the consumption.

That similar conditions exist in many industries in America is coming to be admitted, and the country appears to be entering upon a period of comparative quietude, during which distribution will be compelled to wait upon an enlargement of the demand. History indicates that this enlargement may be expected, but American business men are impatient, and it is a question of whether they will wait patiently for a growth that is normal. If they should grow impatient and slash prices in an effort to accelerate business, then a decline in the commodity price level would follow. But it must be admitted that there is no indication of impatience.

WHAT'S DOING IN INDUSTRY

ANALYSIS of industrial reports received from seven important centers reveals nothing in the way of substantial improvement in the trend of machinery and machine tool business. Slight flurries are felt in a few localities, but in many cases a lessening of activity is noticed.

DETROIT reports a total and permanent eclipse, with the advent of a real summer slump. Some railroad business and a few orders from auto accessory plants are the only bright spots in Chicago. Business in Cincinnati is fairly satisfactory and a few more inquiries lend encouragement. Orders are not picking up as expected in Indianapolis but some buying activity is reported from scattered sources.

NEW ENGLAND trade is spotty, the only real activity being found in the aircraft engine field. Railways and engineering works are still buying in Canada, but a seasonal let-up is beginning to be felt. Sales and inquiries are better in the South and prospects for July volume are bright. New York reports a periodic spurt with a slight increase in sales activity.

THE COUNTRY appears to be entering upon a period of comparative quietude, during which distribution will be compelled to wait upon an enlargement of the demand.

The fact that bank credit is in abundant supply at reasonable rates is a great sedative, and if the growing crops prove to be satisfactory in volume and the prices at which they can be sold will pay a fair profit to the farmers, it is quite possible that an autumnal revival of business will be seen.

One is the disappointment that is coming to be felt in regard to the much talked about railway consolidation. The attitude of the I. C. C. toward the opposed Van Sweringen consolidation leads one financial editor to say that "the hope of any rail merger is being thrown far into the future," and this probably expresses the views of most close students of current events.

Other straws include a decline of 9 per cent in the contracts for new building let in 37 states east of the Rocky Mountains during the month of May; a reduction of nearly 50 per cent in the net operating income of the Union Pacific Railroad for the month of May; a continued increase in business failures, which number 390 for the week ending June 16, as against 377 in the same week a year ago; a decline in car loadings, which were 2½ per cent under last year for the week ending June 11; a reduction in automobile production; during May, 1927, the output of passenger cars was 352,000, as against 373,000 last year, but there was a slight gain in the production of motor trucks which amounted to 44,173 this year, as against 44,071 in 1926.

Other straws that have already been adverted to in these reviews include the overproduction of fuel oil, which still seems to be uncontrolled, and the decline in rubber which is leading the London Times to oppose the government control of exports from the British plantations upon the theory that it will only lead to a "formidable expansion in the Dutch production."

Taking its tone from these and other developments, distributive trade during the week has been comparatively quiet in most lines. The exceptions were cotton and woolen goods, which are moving in fair volume. A distinctly better feeling is also reported from Boston in the market for raw wool. The cotton futures have fluctuated within comparatively narrow limits. An improvement in the crop outlook is generally admitted, but there is a feeling that the government report to be issued on July 9 may show a sensational reduction in the acreage, and everyone recognizes that crop scares during July and August are normal. Therefore, there are but few who have the temerity to go short of the market.

The steel industry is about as it was last week. The demand is described as fair, but the orders are small, and the hope of increased activity is still deferred.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CINCINNATI

Machine tool manufacturers in the Cincinnati district report that business held up in a satisfactory way in the past week. It is thought by the majority that when their books are closed for June a gain will be shown over the previous month. While no great increase is expected in the vacation period, it is thought that some improvement will be seen.

The feature of the week's market was the demand for single tools and replacements, of high efficiency, to replace obsolete equipment, the purchasers being general machinists and miscellaneous users. The week's bookings were well diversified in the matters of sizes and types, and the orders were well scattered over the country.

Orders from railroads and automobile manufacturers were confined to single tools and replacements.

More inquiries were received than in the previous week, the great majority of them being in regard to single tools and replacements. What is regarded as an encouraging feature by some is the fact that the lapsed time between the inquiry and the sale is showing a tendency to lessen.

DETROIT

The machinery market in Detroit has suffered a complete eclipse. For the past two weeks the business has been almost completely at a standstill and there seems little or no likelihood that it will soon improve.

Automobile plants are running below capacity and give no indication that they will increase production in the near future. A few inquiries have been coming in from plants in Detroit and outlying cities, but none of them are for immediate deals. Those companies that are planning alterations or extensions are figuring now on changes that will be made in the fall or later.

The eclipse is not only fairly complete but it seems to be more or less permanent. To some of the machinery dealers it brings back the recollection of a regular summer slump that formerly manifested itself without fail every year. For the past few years the summer slump has not appeared, but it certainly has come back this year.

INDIANAPOLIS

Business in the machinery and machine tool trade in this territory does not appear to be picking up as rapidly as it should, according to local representatives. There are some weak spots, some of which doubtless may be attributed to weather conditions. Demand for special machinery for the furniture trade has dropped off somewhat, though the volume is fair. Dealers are expecting more of this business as soon as the manufacturers can determine the results of the mid-summer shows.

Grinding machines and other small tools for garages appear to be active, with the promise of continued activity throughout the summer months. Some demand is coming from both building and road contractors for equipment.

One of the disappointments, according to dealers, is the light demand from the railroads and public utilities. There is a tendency to stay close to shore and inquiries are light. Another field where a decline has been noticed is the automotive industry. In some instances factories are rather ready buyers, but in the majority production schedules have been cut.

SOUTHERN DISTRICT

Though there has been some improvement in the demand for machinery and machine tools in the Southern territory the past two or three weeks, dealers advise that business has not bettered as rapidly as they had expected, and that, considered as a whole, sales are somewhat less than normal for this period. The inquiry, however, has picked up appreciably, and there is promise of a better tone to business in the next few weeks.

The lumber and furniture industries, though they are doing a considerable amount of new construction, are not buying very actively, though there have been three or four exceptionally large sales reported in this section recently, principally of sawmill machinery. Railroads are fairly active in the market for heavier equipment, and are buying both used and new machinery.

There is also a good demand reported for road building machinery, but a general decline in other construction machinery due to the fact that new building in this territory is at a low ebb right now, due to the uncertainty of the near future occasioned by the flood conditions. Textile mill sales are reported fairly brisk, but they do not appear to have shown any substantial improvement.

CANADA

The trend of business in the metal working industry of Canada is seasonally downward, but both production and consumption are higher than at this time last year. Machinery and machine tool dealers report that orders are being placed in fair volume by the railroads and the automotive industry. Agriculture is also supplying an increasing total of business. Implement plants are busy, and extensions are being found necessary to handle the demand.

The Canadian National Railways have ordered one special 4-spindle drilling machine; one swing cut-off saw; one motor-driven forging hammer; one vertical, hollow chisel mortiser; one Baker type locomotive crane; and one frog and switch planer. The orders were divided between John Bertram and Sons Co., Canada Machinery Corporation, Engineering Equipment Co., and Williams & Wilson.

H. Beaton, general sales manager of General Motors, reports that the Oshawa plants produced 12,190 cars during May, exceeding April of last year by 58 per cent. Tenders are now in the hands of officials of General Motors at Oshawa for the $750,000 stamping mill and toolroom to be erected. From this and other sources, machine tool producers anticipate considerable business.

Machine shops and foundries in Toronto and Hamilton are well booked. In Montreal there has been considerable improvement in the sale of warehouse products. This is mainly due to the fact that large buildings under construction are reaching the stage where they need the smaller metal parts necessary to construction.

NEW ENGLAND

Recent developments in the machine industry in New England are mixed—some decidedly of the constructive sort and others suggestive of a slowing up of business in some lines. The Pratt & Whitney Aircraft Co. of Hartford, has closed contracts for $500,000 worth of "Wasp" engines and parts to be delivered to the air services of the Army and the Navy, and another contract for $1,000,000 worth of engines and parts is expected within a week. The Army order is the first received. The Navy has adopted this engine as standard equipment for observation fliers. The order expected is for the "Hornet," the larger engine developed. In consequence of these orders production schedules will be increased 25 per cent at once.

The Whitney Manufacturing Co., of Hartford, has increased its capitalization from $150,000 to $1,500,000 by stock dividend, making the capital more conformable to the company's modern plant and equipment.

CHICAGO

No material change in the machine tool market has been noted during the last week. The only business of moment reported is that transacted with such railroads as are closing the final items on their lists. A few inquiries are still coming in from this source. The C. R. I. & P. is asking for prices on tools needed in two of its Kansas shops, and one in Illinois. The expectation that the Illinois Central would have come into the market before this time with the list it generally issues early in the year has not been realized. It is believed, however, that the issuance of this list will not much longer be delayed as the road's shop equipment needs are pressing.

The number of inquiries being received from automotive accessory concerns is increasing, and considerable buying on the part of these interests is anticipated at an early date. The John Deere Co. is reported to have closed on practically all items contained in the lists issued last winter.

NEW YORK

Another periodical spurt is reported by dealers and manufacturers' agents in this territory. More than one order was released last week, and the total volume of business might safely be called "fair." At least it is the impression of dealers that the drop in activity has ended, and a slow recovery is now looked for. The used tool market is better, prices for really good tools proving a stimulus.

Here is a partial list of the equipment ordered last week: A boring mill, a planer, power presses, 3 centerless grinders, a car-wheel borer, 2 axle lathes, a 90 in. locomotive axle journal turning lathe, 2 automatic lathes, a vertical shaper, and eight lathes of various capacities.

Manufacturers of electrical supplies are listed as the best buyers at the present time. A larger order for special tools for a refrigeration plant in Russia, and some crane equipment for a hydro-electric project, were reported by a local agency that buys in the United States for the Russian government.

Four Societies to Meet in Detroit During Week of Steel Exposition

It is probable that nearly 25,000 manufacturing executives and scientists of the metal-working and metal-treating industries from every state in the Union, Canada and many foreign countries, will assemble in Detroit the week of September 19 to participate in the numerous technical sessions to be held and to attend the National Steel and Machine Tool Exposition.

It is seldom that four national technical societies interested in the metal industry convene simultaneously in the same city. The American Society for Steel Treating will discuss the manufacture, use and treatment of iron and steel; while the technical sessions of the Institute of Metals will cover the manufacture, use and treatment of nonferrous materials.

The production meeting of the Society of Automotive Engineers will embrace papers covering the latest scientific methods of production in all departments of manufacture including the use of machinery, machine tools, inspection and treatment of materials. In addition, the American Welding Society will have a comprehensive program on the latest developments and uses of welding equipment and material and show the great advances made in the welding industry.

More than 300 firms from all of the metal-working centers of the United States and some foreign countries will use 85,000 square feet to demonstrate their equipment under actual operating conditions, and it will be the largest factory equipment exposition ever held in America. It is expected that the exposition combined with the national meetings of four technical societies will draw to Detroit one of the largest and most representative gatherings of the metal industry ever assembled.

Canadian Steel Imports Cause Comment

Some interesting facts concerning the iron and steel business in Canada were revealed in a recent statement by H. T. Diplock, vice-president of the Steel Co. of Canada, who remarked that more iron and steel was shipped into Canada last year than in any previous year of the Dominion's history. "Canada," he said, "imported about a million tons, which exceeded our own production by 100 per cent. We are worse off now in Canada than we were in 1915 as regards the production of steel. Then we were using lots of rails, but this market has fallen off. Nevertheless, with about a million tons of iron and steel coming into a little country like Canada in one year there seems to be some reason to question whether a change could not be well advised.

"We are confronted with a big problem. Across the line is the colossus of the steel world. The United States today is in the strongest position by far, last year producing 54 per cent of the world's steel. A lot of American mills are so located that the freight is cheaper to many Canadian points than it is from the Canadian mills at Montreal, Sydney or Hamilton. The freight from Duluth to Winnipeg, for instance, is the same as the rate from Fort William to Winnipeg, so that the Eastern manufacturer has to absorb the freight to the head of the lakes before he is on an equal footing with his United States competitor. We are also faced with strong European competition, where they have low wages, depreciated currency, etc."

Japan Making Effort at Industrialization

One of the most important factors in determining the market for American machinery in Japan is the state of Japan's industrial development. The degree of progress in this direction determines both the amount and type of machinery which may be sold in this market. It is Japan's ambition to become industralized to the extent of supplying not only its domestic needs for manufactured goods, but also an important volume for export. Japan's progress toward the realization of this ambition since the outbreak of the World War has been most noteworthy.

This development has had a two-fold aspect. On the one hand, the increased production of goods at home has stimulated the market for industrial machinery of all kinds, while on the other the increased activity on the part of the Japanese machinery industry has limited the demand for certain classes of imported machinery. As the production of machinery required a rather advanced state of industrial development, it is natural that progress in this respect would be less marked than along other lines; here too, however, we find considerable improvement.

The Japanese government has so strongly committed itself to a policy of industrialization and has adhered to this course with such determination that we may reasonably assume that products which can be produced economically in Japan, as well as those products essential to national defense, whether they can be produced economically or not, will in time be manufactured locally. The government is able to control the nature and extent of domestic manufacturing to a degree impossible in perhaps any other country. Subsidies, remission of taxes, and protective tariffs are effectively used to encourage the development of industries. It is possible, however, that such paternalism may eventually lead to development along uneconomical lines in certain fields and reactions may develop.

American exporters may expect to find a gradual changing of their shipments to Japan from the smaller and simpler types of machines to the larger and more highly developed types as Japan's industrial development proceeds. Nevertheless, for the present and immediate future, it is not probable that Japan's industrial development program will be pushed rapidly, for in many industries overdevelopment is already evident.

International Conference in Rome on Industrial Management

American engineers and industrialists are invited to attend the Third International Management Conference to be held in Rome, Italy, Sept. 5, 6, 7 and 8, under the auspices of officials of the Italian government of the city of Rome, and Premier Benito Mussolini.

The program of the convention is to deal with the scientific organization of industrial production, agriculture and commerce, the public service and public utilities, and domestic economy. The papers submitted by the committee on American participation are now in preparation, covering management problems in manufacturing, marketing, simplified commercial practice, office administration, government and municipal administration, railway administration, agriculture, household management and education in the field of industrial engineering. A large part of the program will be furnished by Americans and it is hoped that there will be a large and active participation by American engineers.

Swedish Ball Bearing Industry Expands

The extent to which Sweden's manufacture of ball and roller bearings has been expanded since the outbreak of the world war is indicated by the fact that, according to Swedish customs returns, the value of these exports in 1926 represented more than six times the value of the exports of 1913. The actual figures for these years were as follows: 1913, $978,063; 1926, $6,239,-062. The requirements of the automobile industry in the United States is stated to have created an increased demand for Swedish ball bearings.

Reports from manufacturers of machine tools indicate that the year 1926 was not as successful as had been expected, foreign competition, reduction of the domestic demand and the long credit terms granted by foreign manufacturers being mentioned as the chief contributing factors. It is claimed, however, that a number of plants which came into existence during the war have now been forced to close down. The remaining establishments report improvements in plant and methods.

Canadian Automobile Industry Advances

Revised statistics on the Canadian automobile industry show that the number of motor cars produced in the Dominion during 1926 was 204,727, an increase of 26 per cent over the output of 161,970 cars in 1925, and 55 per cent above 1924. The output in 1926 included 154,061 passenger cars, 30,440 trucks and 20,266 chassis valued in the aggregate at $122,629,537 factory selling prices; parts and repairs worth $10,968,919 brought the total production value for the industry to $133,598,-456 compared with $110,835,388 in 1925.

New York Central Valued at Over a Billion

An Interstate Commerce report recently indicated that the property owned and used by the twenty-eight corporations comprising the New York Central Railroad Co. is valued at $1,038,265,910. This figure will be used as a basis for rate making, but is subject to revision upon proper showing of the railroad. The estimated value of actual property is $737,401,514, and the sum of $31,000,000 is embraced in this value as owned and used on account of working capital, including materials and supplies. The company wholly owns and uses 10,110 miles of track, 58,131 acres of land and 6,726 linear feet of riparian rights, all for common-carrier purposes, with 10,815 acres owned for non-carrier purposes.

Business Items

The Waco Tool Works, 110 North Dearborn St., Chicago, has been organized to manufacture and deal in tools and machinery.

The Grant Tool and Manufacturing Co., 413 North Homan Ave., Chicago, has been formed to manufacture and deal in tools, dies and machinery.

William Galloway & Sons Co., 3 South Dearborn St., Chicago, has been organized to manufacture and sell machinery, engineering and hardware specialties.

Samuel Harris & Co., of 114 N. Clinton St., Chicago, have been appointed distributors in the Chicago territory for the Simonds Saw and Steel Co., of Fitchburg, Mass.

The Industrial Works, of Bay City, Mich., manufacturers of shovels, cranes, draglines, etc., announce the closing of their Florida offices at Tampa. Hereafter the entire Southeastern territory will be handled from the Atlanta offices in the Hurt Bldg.

The Molded Products Corporation of Hartford, Conn., has filed a final certificate of dissolution. The company has been taken over by the Maxim Silencer Co. Hiram P. Maxim, president of the latter company, was a director of the Molded Products Corporation.

The Adrola Corporation, Winsted, Conn., is to start the manufacture of clocks in the Carer & Hakes Building on Sterling Place. The Adrola Corporation is a New York concern and is affiliated with the Gilbert Clock Co., of which Norman F. Thompson, of Winsted, is president.

The J. S. Schofield's Sons Co., of Macon, Ga., operating one of the largest machine shop and foundry plants in the Southeast, recently observed the seventy-fifth anniversary of the founding of the company by the late John Shepley Schofield. The original plant was established in 1852 in a small log-hut at Macon.

The Southern Manufacturing and Supply Co. has been organized and incorporated at Greensboro, N. C., for the manufacture and distribution of textile mill machinery. John L. Bartram, American Exchange Bank Bldg., Greensboro, R. A. Gibbs, Sr., and R. A. Gibbs, Jr., are identified with the company.

The Lincoln Electric Co. announces the following changes and additions to its sales and service department. L. P. Henderson, formerly connected with the Detroit office, has been transferred to Chicago in charge of welder service. J. E. Durstine has been transferred from the experimental engineering department to the welder service department at Cleveland. J. W. Shugars of the time study department at Cleveland, and R. D. Layman also of Cleveland, have been moved to Detroit under the direction of J. M. Robinson. D. H. Carver has been transferred from the machine shop division at Cleveland to the Ohio service division, with headquarters at Cincinnati. R. F. Terrill has been transferred from the general engineering department at Cleveland to the eastern service division, with headquarters at New York.

Personals

T. H. SCHEBRAT recently accepted the position of sales engineer with the Cincinnati Shaper Co., of Cincinnati, Ohio.

PARMLY HANFORD, secretary and treasurer of the Indian Motorcycle Co., of Springfield, Mass., has resigned.

CLARENCE WHITNEY, president of the Whitney Manufacturing Co. of Hartford, Conn., has gone to Europe on a business trip.

STERLING H. BUNNELL announces the opening of an office at 27 William St., New York. He will specialize as a consulting mechanical engineer.

ERIC H. EWERTZ has opened an office at 50 Church St., New York, where he will specialize on problems relative to welding, mechanical and economic engineering.

F. KENNETH SAWYER has been appointed sales agent for the American Steel and Wire Co., of Worcester, Mass., to succeed Frank O. Howard. Mr. Howard has been transferred to the Buffalo, N. Y., office.

FRANK C. PAGE has been elected president of the E. W. Bliss Co., of Brooklyn, N. Y., succeeding the late James W. Lane. Frank D. Mackay was elected first vice-president.

T. C. STEVENS, formerly Chicago representative for the Lodge & Shipley Machine Tool Co., has been transferred to the New York office. He has been succeeded in Chicago by L. V. Eberts.

DR. D. J. MCADAM, JR., metallurgist at the United States Naval Engineering Experimental Station, Annapolis, Md., has been awarded the Charles B. Dudley Medal by the American Society for Testing Materials.

MISS MARY DUNHAM, treasurer of the Shepard Electric Crane and Hoist Co., of Montour Falls, N. Y., has been elected chairman of District B of the Confederation of Zonta Clubs, Inc., which is a business women's organization of national scope.

THOMAS K. MARBURY, of Meridian, Miss., is organizing a new company to establish a plant there during the coming summer for the manufacture of refrigerating machinery, according to a recent announcement by an official of the Meridian Chamber of Commerce.

E. M. HEWLETT has been appointed consulting engineer of switchboard department of the General Electric Co., Schenectady, N. Y. Mr. Hewlett has been engineer of the switchboard department since its formation, and will be succeeded in that capacity by E. B. Merriam.

Obituaries

JOHN M. GOODELL, former editor of *Engineering Record* and an associate editor of *Engineering News*, and a noted figure in the highway and waterworks field, died in New York, June 21 at the age of 60 years. He was at one time assistant secretary of the American Society of Civil Engineers.

CHARLES FREDERIC RAND, mining engineer, former chairman of the executive board of the Engineering Foundation, and one of the leaders of post-war research in American industry, died on June 21 at his home in Hutton Park, West Orange, N. J., at the age of 70. He was former president of the American Institute of Mining and Metallurgical Engineers and held membership in the American Iron and Steel Institute, National Research Council and American Society for Testing Materials.

Auto Industry Mourns Death of J. R. Hall

News of the death of J. R. Hall, vice-president of the Chandler-Cleveland Motors Corporation, of Cleveland, Ohio, was received with profound sorrow by leaders in the automotive and general industrial world. Mr. Hall, who was 60 years old, died on June 11 after an illness of two months.

Born in Dublin, Ireland, he came to this country when he was a youth. In Cleveland he engaged in the machinist trade, working in a number of shops, and finished his apprenticeship with the Kelly Reamer Co.

Mr. Hall then entered the employ of the old Lozier company and in a very short period took over supervision of the shop. In the Lozier shop he acquired valuable experience. Later he went abroad in a mechanical capacity. He spent a year in England and nine years in Germany, with headquarters in Hamburg.

Returning to America, he was placed in charge of the Lozier service department in New York and later at the Lozier factory, in Detroit. Directly following this Mr. Hall was called to Cleveland as factory manager for the Chandler Motor Car Co. The conscientious and systematic shop practices instituted by him soon brought recognition in the form of his election to vice-president of that company. When the Cleveland Automobile Company and the Chandler Motor Car Company consolidated into the combine known as the Chandler-Cleveland Motors Corporation, Mr. Hall continued as vice-president in charge of production. He was identified with many technical organizations, among them the Society of Automotive Engineers and the American Society for Steel Treating.

Forthcoming Meetings

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Machine Tool Builders' Exposition. First annual machine tool exposition, conducted by the National Machine Tool Builders' Association, at the West Annex of the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, chairman of the exposition committee. Roberts Everett, manager of the exposition, 225 West 34th St., New York. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Building, Cincinnati, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

RAILWAY buying of steel materials continues active; butt weld steel pipe is also in good demand. There is unmistakable dullness, however, in the current market for pig-iron and scrap metals, (copper particularly) while no improvement appears, so far as c.i. pipe or wire nail demand is concerned. Other materials listed show no appreciable changes. Present production rate of steel ingots is below the national average of a year ago. Maximum quotations on principal hot-rolled steel materials, base, Pittsburgh, in several carload quantities, are definitely under levels of June, 1926. Bars are now $1.75@$1.90; plates, $1.75@$1.85; shapes, $1.70@$1.85 per 100 lb. A year ago bars were $2 and plates and shapes, $1.90 per 100 lb., f.o.b. mill.

(All prices as of June 24)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.19
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	27.17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	23.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.15@2.25	3.50	3.25	3.89
No. 12	2.20@2.30	3.55	3.30	3.94
No. 14	2.25@2.35	3.60	3.35	3.99
No. 16	2.35@2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.60@2.70	3.75	3.75	4.00
No. 22	2.75@2.85	3.90	3.90	4.15
No. 24	2.80@2.90	3.95	3.95	4.20
No. 26	2.90@3.00	4.05	4.05	4.30
No. 28	3.05@3.15	4.20	4.20	4.45
Galvanized				
No. 10	2.95@3.05	4.10	3.95	4.25
Nos. 12 to 14	3.05@3.15	4.20	4.05	4.35
No. 16	3.15@3.25	4.30	4.15	4.45
No. 18	3.30@3.40	4.45	4.30	4.60
No. 20	3.45@3.55	4.60	4.45	4.75
No. 22	3.50@3.60	4.65	4.50	4.80
No. 24	3.65@3.75	4.80	4.65	4.95
No. 26	3.85@3.95	5.05	4.90	5.20
No. 28	4.10@4.20	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — B.w.g. and Decimal Fractions		Outside Diameter in Inches — ⅛	¼	⅜	½	1	1¼	1½
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	21	23	.25
065″	16	.19	.20	.21	.22	23	.25	.27
083″	14	.20	.22	.23	.24	.25	.27	29
095″	13	.21	.23	25	26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
134″	10	.24	26	.28	.29	30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 1/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 1/16@¼-in. thick.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic, up to carlots, New York	13.75		
Tin, pigs, 5-ton lots, New York	69	62½	
Lead, pigs, up to carlots, E. St. Louis	6.15	New York	7.00
Zinc, slabs, up to carlots, E. St. Louis	6.17½	New York	7.12½

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	15.00	17.50	15.00
Copper sheets, base	21.50	21.50	21.50
Copper wire, base	18.25	18.25	14.75
Copper bars, base	21.12½	21.25	21.12½
Copper tubing, base	23.50	24.25	23.50
Brass sheets, high, base	17.75	17.75	17.75
Brass tubing, high, base	22.62½	22.62½	22.62½
Brass rods, high, base	15.50	15.62½	15.50
Brass wire, high, base	18.25	18.25	18.25

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26 02
Zinc sheets (casks)	11 00	11 30	10 11
Solder (½ and ½), (case lots)	41 00	42 00	38½@42½
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade	86.00		
Commercial genuine, intermediate grade	61 00		
Anti-friction metal, general service	31 50		
No. 4 babbitt (f.o.b.)	13 00		
Nickel, f.o.b. refinery, cents per lb.:			
Ingots 35.00 Electrolytic 39.00 Shot	36.00		

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.12½@11.37½	10.50	9.75@10.25
Copper, heavy, and wire	10.37½@10.87½	10 50	9.00@ 9.50
Copper, light, and bottoms	9 12½@ 9 62½	9.00	8.00@ 8 50
Heavy lead	5 00 @ 5 50	5.25	4.50@ 5.00
Tea lead	4.25 @ 4.50	3.25	3 00@ 3.50
Brass, heavy, yellow	7 00 @ 7.50	6.75	6.50@ 7.00
Brass, heavy, red	8.75 @ 9.00	9.25	8.50@ 9.00
Brass, light	5.00 @ 5.50	6.00	5.50@ 6.00
No. 1 yellow rod turnings	7.50 @ 7 75	7.00	6.50@ 7.00
Zinc	3.75 @ 4.00	3.00	2.50@ 3.00

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0 15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@ 17
Wiping cloths, washed white, per lb	.15½	36.00 per M	.15
Sal soda, per lb	.02½	.02	.02¾
Roll sulphur, per lb	.02¾	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.89½	.99	.90
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.33	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb	.155	.1587½	.1662½
Solder (½ and ½)	per lb.	.41	.41	.3675
Cotton waste, white	per lb.	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	.65	.55	.55
Machine oil	per gal.	.33	.33	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville,	3.00@3.25
Coke, prompt foundry, per net ton		Connellsville,	4.25@4.75
White lead, dry or in oil,	100 lb. kegs	New York,	13.75
Red lead, dry,	100 lb. kegs	New York,	13.75
Red lead, in oil,	100 lb. kegs	New York,	15.25

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in	50%	50–10%
Larger up to 1 x 30-in	45%	50%
1¼ and 1½ in. dia	30%	35%
Carriage bolts:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Coach and lag screws:		
Up to ½ x 6-in	50–10%	
Larger sizes	50%	
Tap bolts, hexagonal heads	45%	
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	
Case hardened, hexagonal, tapped, in packages	30%	
Washers: Deduct from list, per 100 lb.	$1.50	$3.50
Rivets, button and cone head:		
Small, including ⅞-in. dia		50–10%
Large (base) per 100 lb.	$6.50	$5.00

EXTRA per 100 lb. on rivets, for ½-in. dia., 35c.; ⅝-in., 15c.; 1-in., 5c.; length 1-in. and shorter, 25c.; longer than 1-in. up to and including 1 ½-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Ind., Evansville—Faultless Caster Co.—⅝ in. cold header, Waterbury-Farrel or Manville double stroke solid die crank type preferred to knuckle joint.

Mass., Arlington (Boston P. O.)—Bd. of Public Works—miscellaneous tools and equipment for proposed 1 story, 70 x 140 ft. garage and repair shop.

Mass., Brighton (Boston P. O.) Heil Hoist Co., 298 North Harvard St.—½ ton overhead traveling crane for Mounting Service Station at North Beacon and Market Sts.

Mass., Jamaica Plain (Boston P. O.)—H. Bettoney, 106 Chestnut Ave.—motor driven polishing lathe and several small bench upright drills.

Mass., Milford—Milford Iron Foundry—electric arc welding equipment, 150 to 200 amp. generator connected to 220 v., 60 cycle, 3 ph. motor.

Mass., Wellesley (Boston P. O.) — Wellesley Colonial Garage, Inc., Linden and Central Sts.—miscellaneous tools and equipment for proposed 2 story, 105 x 140 ft. repair and service garage.

N. Y., Buffalo—Dept. of Public Safety, machinery and equipment for garage and repair shop to cost $45,000.

O., Lebanon—Eco-Thermal Stove Co., S. S. Thomas, Gen. Mgr.—two presses, three molding machines and other equipment for proposed new plant to replace fire loss.

Pa., Philadelphia—Dept. of City Transit, 1211 Chestnut St.—will receive bids until July 8 for four 20 ton, four 15 ton, two 5 ton and one 3 ton electric overhead traveling cranes for shops for Broad St. subway.

Tex., Beaumont — A. R. Hazard & R. Maverick—complete machinery and equipment for proposed hangar and tool shop. Estimated cost $60,000.

Tex., Brownsville — Brownsville Sheet Metal Works, c/o H. Richardson—machinery and equipment for proposed machine shop. Estimated cost $60,000.

Que., Montreal—J. W. Butler, 953 St. Alexander St.—complete equipment for proposed auto repair shop.

Opportunities for Future Business

Calif., Los Angeles—E. C. Anthony, Inc., 1000 South Hope St., awarded contract for the construction of a 4 story, 150 x 160 ft. addition to garage at 10th and Hope Sts. Estimated cost $250,000.

Calif., Los Angeles—West Coast Foundry Co., c/o Industrial Building Co., Pacific National Bank Bldg., Designers, is having plans prepared for the construction of a foundry at 1st and Gates Sts.

Calif., South San Francisco — Pacific Coast Steel Co., Rialto Bldg., San Francisco, plans the construction of a 60 x 120 ft. addition to galvanizing plant, etc., here.

Conn., Hartford—Arrow Electric Co., 103 Hawthorne St., had plans prepared for the construction of a 1 story, 62 x 500 ft. factory on Capital St. Estimated cost $125,000. Mylchreest & Reynolds, 238 Palm St., Archts.

Conn., Hartford—White Motor Co., B. M. Holden, 750 Main St., will have revised plans prepared for the construction of a 1 story, 150 x 150 ft. service station on Maple Ave. Estimated cost $100,000. Private plans. Former bids rejected. Noted June 23.

Conn., Milford—Aircraft Corp. of American, J. H. Stelling, Pres., manufacturers of airplanes, awarded contract for the construction of a 1 story, 150 x 350 ft. plant on Laurel Beach Rd. Estimated cost $150,000.

Ill., Chicago — Hills-McCanna Co., 2025 Elston Ave., manufacturers of force feed oilers and engine lubricators, awarded contract for the construction of a 1 story, 60 x 200 ft. factory at Western Ave. and Nelson St. Noted Apr. 14.

Ind., Bedford—The Bedford Foundry & Machine Co., plans the construction of a 1 story steel fabricating plant and machine shop. Estimated cost $60,000. R. N. Fager, Engr.

Ia., Dubuque — Maizewood Products Corp., Dubuque, Ia., H. Brennan, Pres., 209 South State St., Chicago, Ill., will receive bids about July 1, for the construction of a 1 story, 60 x 450 ft. wall board factory. Estimated cost $100,000.

Kan., Emporia—Atchinson, Topeka & Santa Fe Ry., 80 East Jackson Blvd., Chicago, Ill., awarded contract for the construction of a 1 story, 38 x 110 ft. planing mill and 1 story roundhouse, etc. here. H. W. Wagner, Topeka, Kan., Ch. Engr. (Eastern Line). Noted May 26.

Me., Kittery—A. F. Cook, is receiving bids for the construction of a 1 story repair and service garage. Estimated cost $40,000. Dow, Harlow & Kimball, 184 Boylston St., Boston, Archts.

Mass., Boston—S. S. Dean, 50 Congress St. awarded contract for the construction of a 1 story, 100 x 150 ft. repair and service garage at 290 North Beacon St. Estimated cost $50,000. B. Brown, 65 Franklin St., Engr.

Mass., Boston—M. M. Dwyer, 77 Linden St., awarded contract for the construction of a 1 story repair and service garage. Estimated cost $40,000.

Mass., Brookline (Boston P. O.)—Hotel Beaconsfield, 1731 Beacon St., is receiving bids for the construction of a 1 story addition to garage and repair shop. Estimated cost $70,000. H. F. Bryant, 334 Washington St., Archt. Noted Jun. 9.

Mass., Chelsea (Boston P. O.)—Union Motor Sales Co., 40 Fourth St., is receiving bids for the construction of a 1 and 2 story repair and service garage. Estimated cost $40,000. Eisenberg & Feer, 46 Cornhill, Boston, Archts.

Mass., Holyoke—F. Rainault, F. H. Franz, 26 High St., Archt., is receiving bids for the construction of a 1 story repair and service garage on Cabot St. Estimated cost $50,000. Noted Dec. 30.

Mass., Marblehead (Boston P. O.)—M. H. Lukens, 69 Washington St., plans the construction of a 1 story repair shop and service station. Estimated cost $40,000. Architect not elected.

Mass., Milton (Boston P. O.)—Godfrey Coal Co., Wharf St., awarded contract for the construction of a 1 story garage and repair shop. Estimated cost $40,000.

Mass., South Boston (Boston P. O.)—R. S. Brine Transportation Co., 43 India St., Boston, is having revised plans prepared for the construction of a 1 story, 70 x 120 ft. garage and repair shop at 194 West First St. here. E. C. Luce, Jr., 14 Beacon St., Boston, Archt. Former bids rejected.

Mass., Westfield—MacCoullier Bros., 44 Broad St., awarded contract for the construction of a 1 and 3 story repair and service garage, etc. Estimated cost $50,000.

N. J., Camden—Bell Storage Co., 1006 South 6th St., awarded contract for the construction of a 6 story warehouse and garage at Haddon Ave. and Copewood St. Estimated cost $200,000.

N. Y., Buffalo—Niagara Machine & Tool Works, 637-697 Northland Ave., will soon award contract for the construction of a machine shop. Estimated cost $100,000. H. E. Plumer & Associates, 775 Main St., Archts. and Engrs.

O., Canton—Union Metal Mfg. Co., 1432 Maple Ave., manufacturers of metal standards, lighting and punch columns, etc. plans the construction of a 1 story, 50 x 100 ft. factory at 1424 Maple Ave. N. E. Estimated cost $40,000. R. O. Karchner, Engr.

O., Cleveland — The Marble & Shattuck Chair Co., T. W. Foote, Mgr., 10200 Foster Ave., is having plans prepared for the construction of two 4 story, 66 x 121 and 80 x 100 ft. factory buildings. Estimated cost $250,000. H. M. Morse & Co., Finance Bldg., Archts.

O., Columbus—Columbus Auto Parts Co., 215 East Russell St., awarded contract for the construction of a 2 story addition to factory at Fount and Russell Sts. Estimated cost $40,000.

O., Columbus—Company to be incorporated, B. Reinmund, Promotor, is having sketches made for the construction of a 12 story, 125 x 187 ft. garage on North Front St. Estimated cost $150,000. Snyder & Babbitt, 16 East Broad St., Archts.

O., Dayton—The Daytonia Garage, 202 West Second St., had plans prepared for the construction of a 4 story repair and service garage. Estimated cost $200,000. Schenck & Williams, Third National Bank Bldg., Archts.

O., Wheelersburg—M. Journey, awarded contract for the construction of a 2 story, 40 x 80 ft. repair and service garage on Gallia St. Estimated cost $35,000.

Okla., Wewaka—E. J. Peters, 220 South Broadway, Shawnee, had plans prepared for the construction of a 3 story, 75 x 145 ft. repair and service garage. Estimated cost $90,000.

Pa., Philadelphia—B. M. Miller, c/o R. R. Kohn, 1720 North Creighton St., Archt., will soon award contract for the construction of a 2 story, 53 x 175 ft. garage at 2026-2028 North 22nd St.

Pa., Pittsburgh — Argonaut Realty Co., General Motors Co., Highland Park, Mich., awarded contract for the construction of a 1 and 2 story, 220 x 290 ft. assembly plant on 37th St. Estimated cost $350,000.

Pa., Pittsburgh — Englert McKean Auto Co., 2134 Brownsville Rd., awarded contract for the construction of a 2 and 3 story, 80 x 100 ft. sales and service station on Bigelow Blvd. Estimated cost $150,000. Noted June 2.

Tex., San Antonio — Smith Bros. Properties Inc., c/o Plaza Hotel, is having plans prepared for the construction of a 4 story, 80 x 190 ft. garage at Bowen's Island and Villita St. Estimated cost $125,000. A. B. & R. M. Ayres, 626 Bedell Bldg., Archts. Noted June 9.

Vt., White River Junction—Miller Auto Co. awarded contract for the construction of a 2 story addition to garage and repair shop. Estimated cost $40,000. Wells & Hudson, Hanover, N. H., Archts.

Wis., Oshkosh—The Universal Motor Co., E. H. Fahrney, Pres., 39 Ceape St., manufacturers of gasoline engines, etc., awarded contract for the construction of a 150 x 378 ft. plant.

Ont., Oshawa—The General Motors Co. of Canada, Ltd., awarded contract for the construction of a 200 x 500 ft. stamping building, 70 x 100 ft. machine shop and 50 x 250 ft. enameling plant. Estimated cost $600,000.

American Machinist

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Vol. 66, No. 26 — New York, June 30, 1927 — 25 cents a copy

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Rounding Up the Round Table

JUST twelve months ago the "Foreman's Round Table" became a regular department of the *American Machinist*. It has apparently filled a real need by providing a place where foremen, superintendents and managers can give their frank opinions on live questions that must be answered every day in the shop. The opinions of practical shop men on the questions that have been discussed during the past year are significant of the metal working shop practice of today and they are well worth careful study. In this week's "Round Table" they have been analyzed and grouped to make them readily available. They are commended to your attention.

McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Ave. at 36th St., NEW YORK, N. Y.

New York District Office, 285 Madison Ave.
Washington, Colorado Building
Chicago, 7 S. Dearborn St.
Philadelphia, 1600 Arch St.
Cleveland, Guardian Building
St. Louis, Bell Telephone Bldg.
San Francisco, 883 Mission Street
London, 6 Bouverie St., London, E.C.4

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Publishers of
American Machinist — Engineering News-Record
Power — Chemical and Metallurgical Engineering
Coal Age — Engineering and Mining Journal
Ingeniería Internacional — Radio Retailing
Bus Transportation — Electric Railway Journal
Electrical World — Electrical Merchandising
Industrial Engineer — Construction Methods

Electrical West *(Published in San Francisco)*
American Machinist—European Edition *(Published in London)*

Change of Address — When change of address is ordered the *new* and the *old* address must be given. Notice must be received at least ten days before the change takes place.

Copyright, 1927
By McGraw-Hill Publishing Company, Inc.

Published weekly
Entered as second-class matter June 23, 1879, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

Member Associated Business Papers, Inc. Member Audit Bureau of Circulation
Average number of copies per issue printed during month of May, 17,423

Hobbled With High Costs?

In these days of keen competition, the poorly equipped factory is hopelessly hobbled in the race for profits.

If some out-of-date machine tools are hobbling your own business, better take the hobbles off, by replacing those obsolete tools with modern

Machine Tools—
The Master Tools of Industry

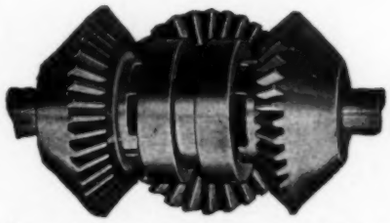
Modern Equipment Increases Profits

NATIONAL
MACHINE TOOL BUILDERS'
ASSOCIATION

THE JOHNSON FRICTION CLUTCH

as used on

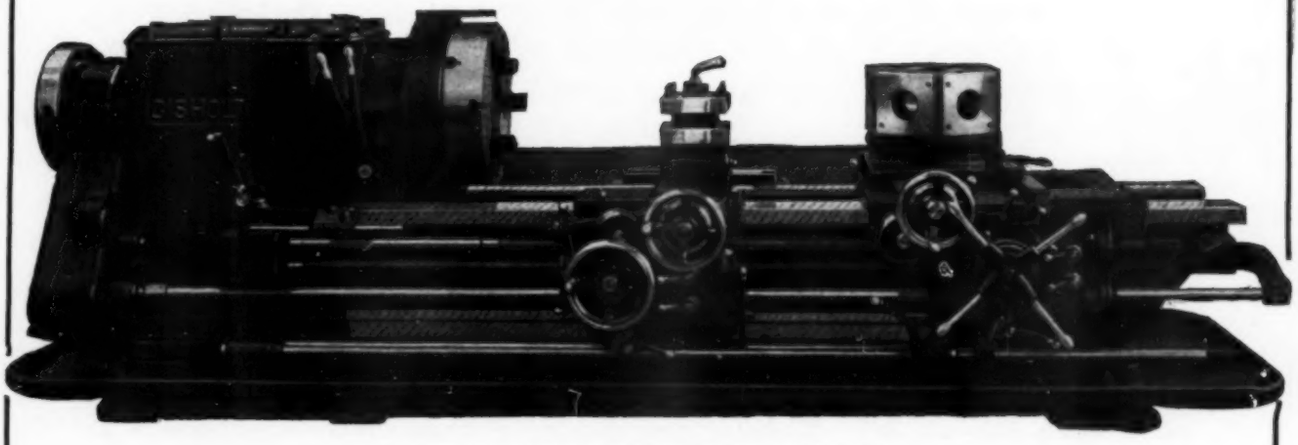
The New Type 3L Gisholt Turret Lathe



Johnson Double Clutch between Bevel Gearing

THE No. 2 Double JOHNSON Clutch is located in a bonnet on the rear side of this capable Gisholt lathe shown below. The clutch is used in connection with the power traverse. The powerful, long-life JOHNSON Clutch on this Gisholt will last while the lathe lasts.

Double Clutch Exterior



COURTESY: The Gisholt Machine Company, Madison, Wis.

Handling practically any piece of work that is held in the chuck of an engine lathe, this "L" Type Gisholt is a mighty profitable machine. And when you combine JOHNSON Clutches with Gisholt merit you have a combination which means reduced production time for the manufacturing plant or railroad repair shop. The JOHNSON is the great lathe clutch. Equip with JOHNSONS.

Write for Blue Catalog

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

What's in

In this day of highly developed ways and means of doing things, a trade mark and a good reputation mean a whole lot. However, more important than anything is the product itself.

Many articles have been marketed, advertised extensively and a big demand for them created, only to be later lost in the shuffle because that important item — QUALITY — was thoughtlessly let go of. Some manufacturers, possibly, believed that after a demand was created they could "coast." In other words, they could cheapen their product and live on their reputation. But did they?

The industrial graveyard is full of such experiments. They all go to the same end. As soon as "quality" leaves, its running mate "demand" goes with it.

If you see a product advertised year after year and it continues to hold the respect of all who use it, *there* is one that deserves your careful consideration. *There* is a product in which it is shown conclusively that quality and nothing else predominates. And without Quality where would its past reputation take it? How far would a well-known trade mark carry it? The answer is apparent and serves well to bring out the point that without quality an article is "dead."

What is Quality?

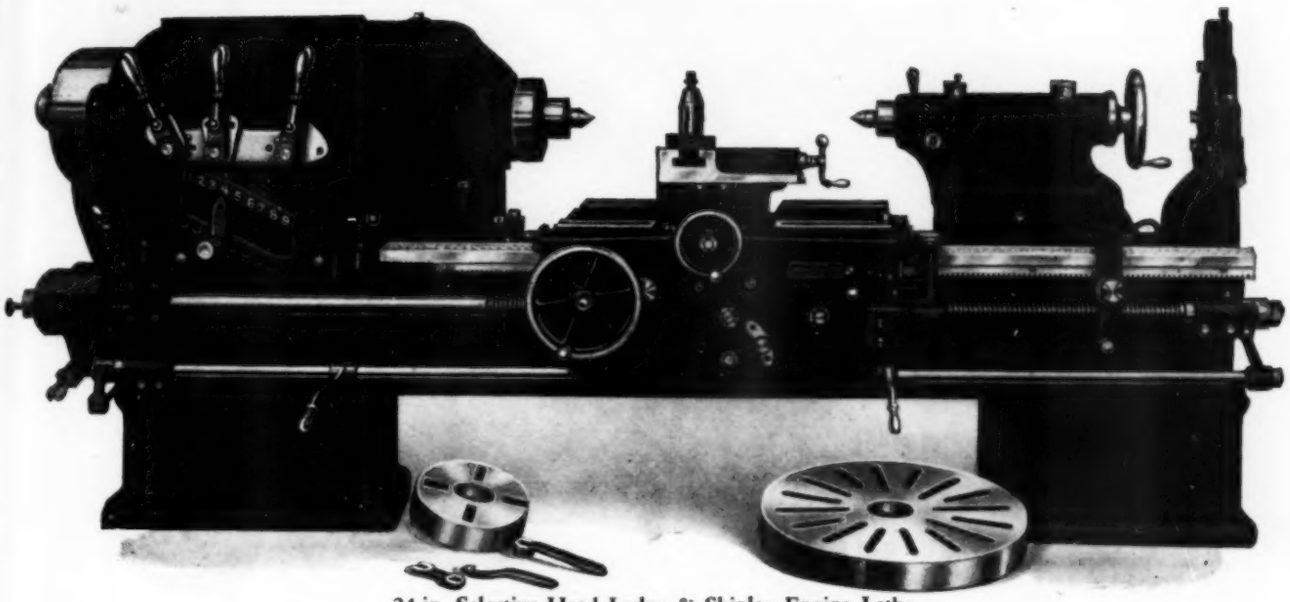
Now, there, we are getting down to facts! How can you tell quality when you see it? Webster says quality is that which distinguishes a person or thing from the ordinary. We believe Webster hit the nail on the head. It's a safe bet that anything in a class by itself; anything that possesses distinctive character, is chuck full of quality.

And that's that!

The Lodge & Shipley

Cincinnati,

a name?



24-in. Selective Head Lodge & Shipley Engine Lathe
Made in sizes 12 in. to 48 in.

The Lodge & Shipley Lathe

Is in a class by itself.

Why?

Not just because we say so; not merely because it has been advertised extensively for over three decades and not because our trade mark is "Lathes, Good Lathes Only!" The reason is because Quality is *built in* and not just *talked about*. The founders of this business believed that there was a big market for a quality lathe; a lathe that was distinctive in character. We simply are carrying out their ideas of what a good lathe should be.

Our chief concern is not just to *say* that it is a good lathe but to *prove* it by building QUALITY in each and every one.

It isn't merely the name. The name is as good as the product.
Our name is *good!*

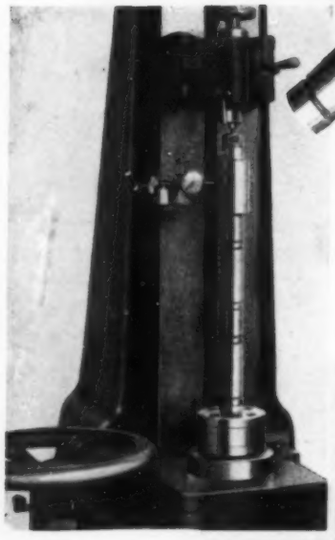
REASON IT OUT!

Send for catalogue
No obligation

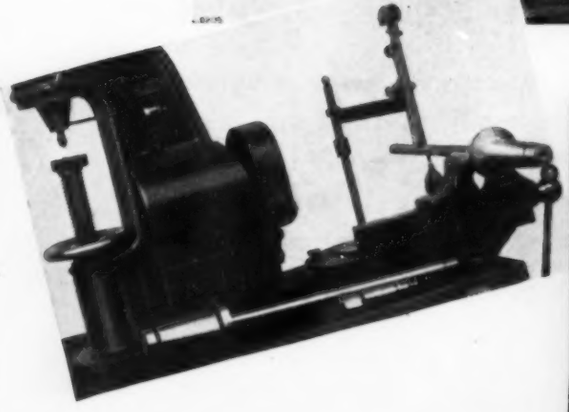
Machine Tool Co.
Ohio

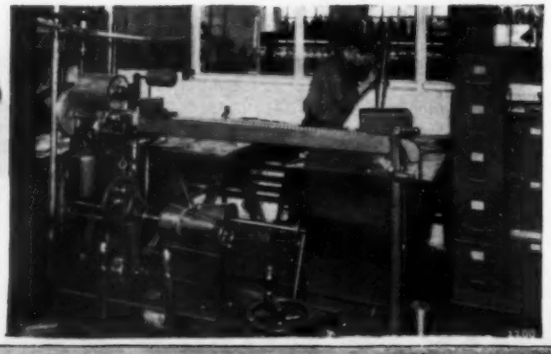
CINCINNATI
MAKES MORE MACHINE TOOLS, IN LARGER VARIETY, THAN ANY OTHER CITY IN THE WORLD.
TO SEE AN UP-TO-DATE MACHINE TOOL COME TO
CINCINNATI

TEST TEST test



IN addition to all of the advantages which you obtain through the use of the new standard Spindle End, you now have available Cincinnati Arbors with their unusual accuracy, strength and quality.





CINCINNATI MILLERS

Advantages to You in using CINCINNATI *Standard Arbors*

1. They are manufactured by the largest makers of milling machines in the world.

CINCINNATI *Arbors*

2. They are made in a special department with special machines, and undergo the most rigid tests to insure the highest possible accuracy.

CINCINNATI *Arbors*

3. The arbor collars are hardened and are ground on both inside and outside diameter and on the ends—insuring long life and the maintenance of the original accuracy.

CINCINNATI *Arbors*

4. They possess unusual strength, being made from specially selected and tested drop forgings, and are heat treated through processes developed by us after years of experience in the manufacture of arbors.

CINCINNATI *Arbors*

5. Single wrench used for draw-in bolt—same wrench used for standardized nuts on the machine proper.

CINCINNATI *Arbors*

6. Every arbor and every collar is subjected to a series of most rigid tests, making it certain that the high standard for these arbors is maintained.

CINCINNATI *Arbors*

7. Cincinnati arbors have the National Standard keyway. All cutters can be used on Cincinnati arbors.

CINCINNATI *Arbors*

8. Cincinnati arbors can be used on any other milling machine in your plant which is equipped with the Standard Spindle end.

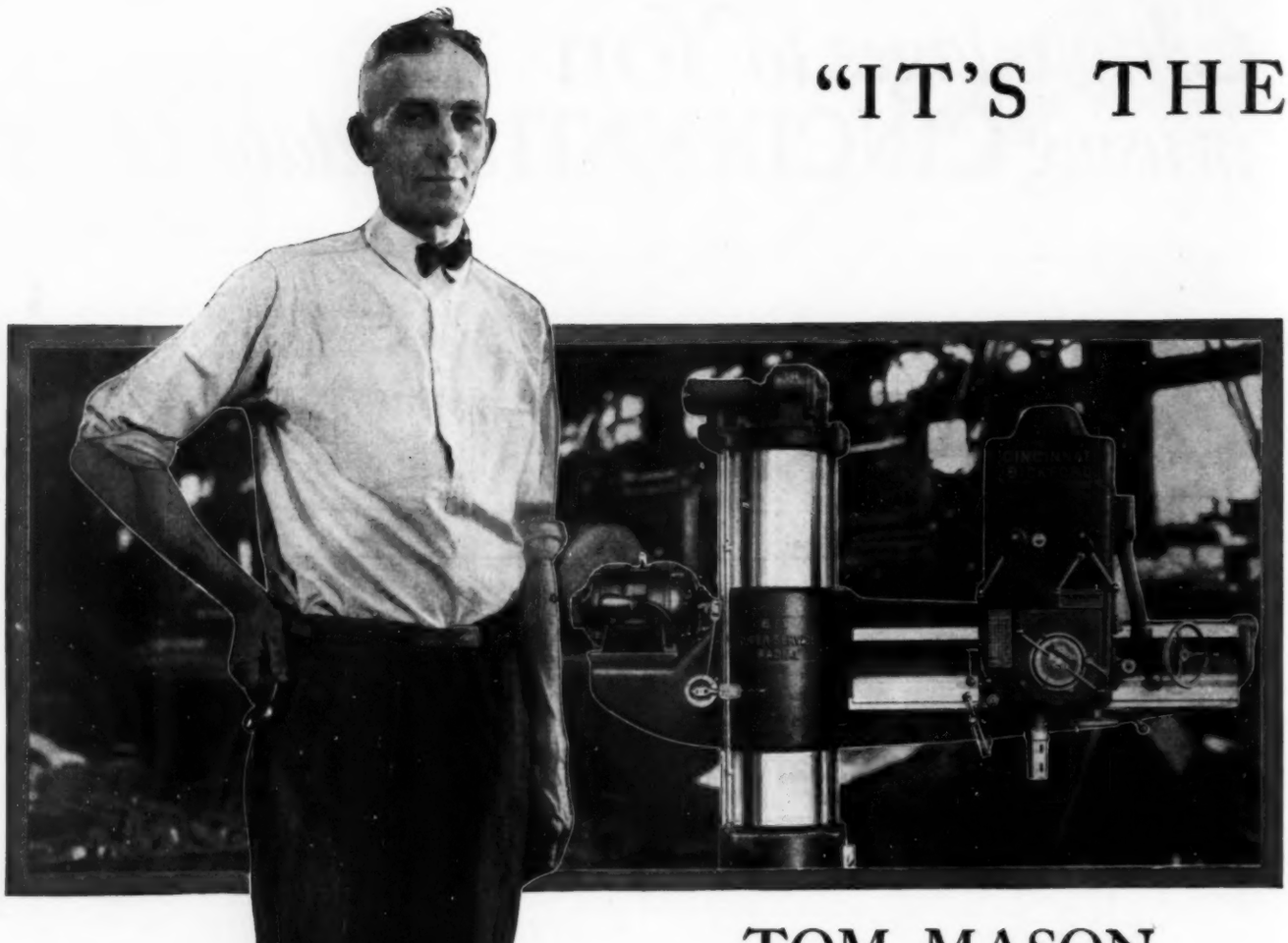
CINCINNATI *Arbors*

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI · OHIO · U·S·A·

CINCINNATI MILLERS

"IT'S THE



TOM MASON
MASTER MECHANIC

Tom Mason is chief surgeon to the machine tools of the Hutchins Manufacturing Company. Tom's department handles anything from first aid with a wrench and a screw driver on up to major surgery that calls for the removal of gears, shafts and bearings.

Tom's a good diagnostician of machine tool ills. His ear is trained to all of the knocks and pounds of sick machinery; his hands are skilled in the use of files and scrapers; his eye is keen to detect anything that even borders on poor workmanship. Above all, he is a mechanic of the first order. And the men in his department are high grade mechanics. They have to be or they couldn't work for him. When they finish a job, they don't leave any scars.

Tom has held post-mortem examinations on nearly every machine tool in the plant. He knows their strong points and their weak ones. Tom Mason is an authority. That's why we asked him for his opinion of the SUPER-SERVICE Radial that has been running double shift for three months in the Hutchins works. Tom's department hasn't touched that machine; he doesn't expect it to—at least not for a long time—because he knows how that machine is built. We'll let him tell you what he thinks of it.

One of a series in which the men of the Hutchins Manufacturing Company express their opinion of the SUPER-SERVICE Radial that is operating in their plant.

BEST-BUILT RADIAL I'VE EVER SEEN..."

WHAT TOM MASON SAID:

"My job wouldn't amount to much if all our machine tools were built like the SUPER-SERVICE Radial. I went through the Cincinnati Bickford plant and saw how that machine is put together. I know what's in it; it's the best-built radial I've ever seen—and I've seen a lot of 'em in my time.

"If there are any machines in our plant that get more punishment than the radial drills, I don't know what they are. Believe me, our radial drill department hits the ball. They haven't any mercy on their equipment. They turn out the work, but we're right behind 'em keeping their machines in condition. If it isn't a frozen spindle bearing, it's a speed box or something else gone wrong. About every third year they get a general overhauling. At that, they don't get it before they need it.

"When I watched 'em build the SUPER-SERVICE at Cincinnati Bickford, I figured that the fellows who designed it must have worked on maintenance at some time or other — because they got rid of the things that cause most of the trouble on radial drills. "For instance: take tumbler gear speed boxes; they've given us more trouble than anything else. When they go to the bad you can hear 'em all over the shop. The gear teeth are hammered out of shape and the bushings are battered out of round. And when they're shot, nothing short of a complete overhauling will do. But that's licked on the SUPER-SERVICE. All of the speed changes are made through sliding gears. These gears can't get out of adjustment and pound themselves to pieces, because they run on fixed centers.

"Then there are these spring-dive-key-feed mechanisms. We've got some radials with coarse feeds from .050" to .125". Whenever an operator forgets what he's doing and throws in a coarse feed with the spindle running at high speed—snap goes the dive-key! There's nothing like that on the SUPER-SERVICE, because it hasn't any dive-key feeds. The feed changes are made through sliding gears. You can not only engage any feed up to .125", while the spindle is running at top speed, but you can change feeds *while the tools are cutting*. Try and do it with a spring-dive-key.

"Squirt-can oiling brings more repair jobs into my department than anything else. The operators will not take time to oil their machines. A radial drill with squirt-can oiling should be oiled twice on each shift. It takes ten minutes to oil a radial drill and oil it right. If our operators spend three minutes oiling up, they're doing well. Believe me, when I get an S. O. S. because a spindle bearing is frozen that's when I start to 'fog'. It takes only thirty seconds to oil a spindle, but it takes three hours to repair one that's been frozen — frozen because somebody failed to oil it. Now take that SUPER-SERVICE Radial; it runs three months on one oiling. The spindle runs in roller bearings packed in grease. There's even a Purolator Oil Filter in the head. That kind of oiling keeps the machine out of the repair shop—keeps it in production where it belongs.

"Loose keys have got a lot to do with big repair bills. I never tore down a machine tool with loose keys, a machine that has had a lot of hard going, that I didn't find most of the keys and keyways battered all out of shape. And don't forget that it takes a lot of time to cut new keyways and fit new keys. There isn't a loose key on the SUPER-SERVICE Radial. Every shaft is multiple-splined. That kind of stuff doesn't need much comment.

"When it comes to bearings, there's no argument against Timkens. The entire drive from the motor to the spindle nose of the SUPER-SERVICE Radial runs in Timken roller bearings.

"As I said before, it's the best-built radial drill I've ever seen —and I've seen a lot of 'em in my time."

The SUPER-SERVICE Radial

THE CINCINNATI BICKFORD TOOL COMPANY

OAKLEY, CINCINNATI, OHIO

J&L
JONES & LAMSON

THIS thread is not ground. It looks as though it were; actually, it was cut with a J & L Die—"High Speed Series."

Its accuracy as well as its finish suggests grinding. All J & L Chasers are guaranteed to cut lead accurate to .001" per inch.

Diameters may easily be held to .001" variation.

J&L
JONES & LAMSON

Hartness Flat Turret Lathe
Fay Automatic Lathe
Hartness Double Spindle
Flat Turret Lathe

Jones & Lamson

Springfield,

Pacific Coast Agents:

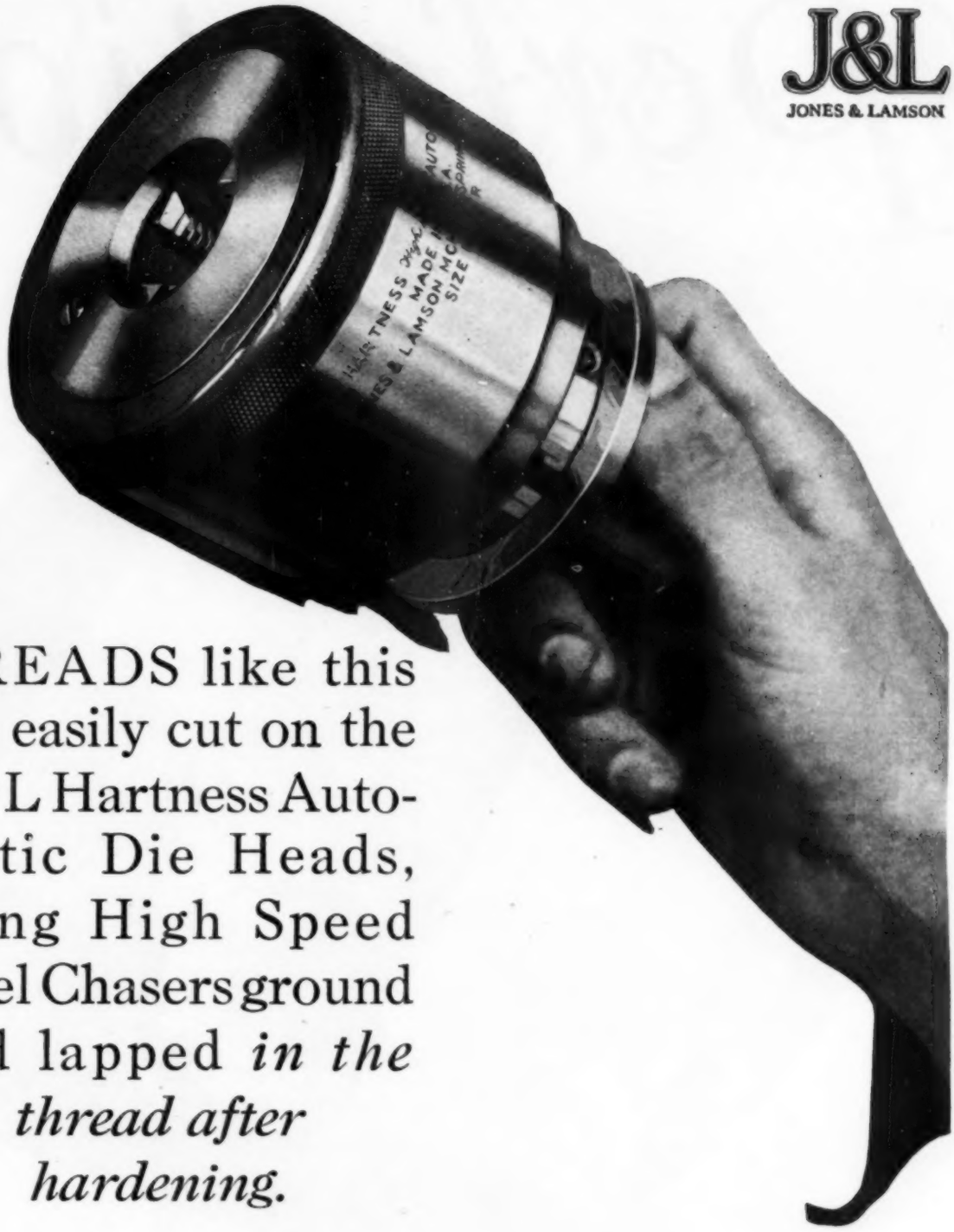
SAN FRANCISCO, CALIFORNIA
C. F. Bulotti Machinery Company
829-831 Folsom Street

LOS ANGELES, CALIFORNIA
Reeves & MacBride
443 East Third Street

SEATTLE, WASHINGTON
Perine Machine Company
209 First Avenue, South

PORTLAND, OREGON
Woodbury & Wheeler
55 Second Street

J&L
JONES & LAMSON



THREADS like this are easily cut on the J & L Hartness Automatic Die Heads, using High Speed Steel Chasers ground and lapped *in the thread after hardening.*

Machine Company

Vermont, U. S. A.

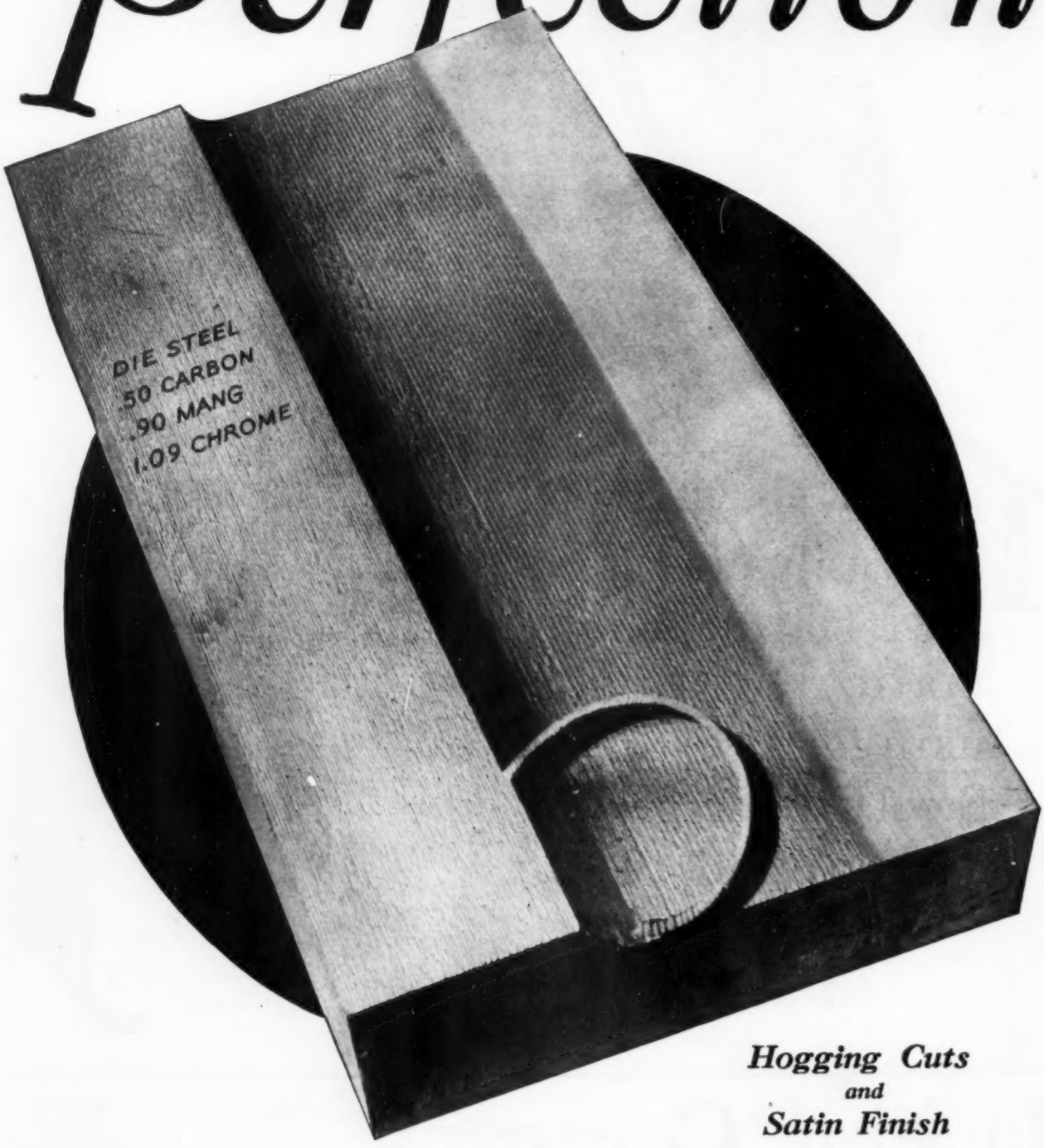
J&L
JONES & LAMSON

Hartness Automatic Die
Flanders Ground Tap
Hartness Screw Thread
Comparator

Foreign Agents:

ENGLAND, Jones & Lamson Machine Company 19-21 Water Lane, Queen Victoria St., London
HOLLAND, Spliethoff, Beeuwkes & Company Luevehaven, Wz. 159, Rotterdam
FRANCE, SPAIN, BELGIUM, SWITZERLAND, PORTUGAL and ITALY, Fenwick Freres & Company, 8 Rue de Rocroy, Paris
GERMANY, M. Koyemann, m. b. H. Dusseldorf
JAPAN, KOREA, MANCHURIA and FORMOSA Mitsui & Company, Ltd., Tokio
CZECHOSLOVAKIA, Ing. M. Kocian & G. Nedela Praha VIII, Palmovka
SWEDEN, Aktiebolaget Servus Kungsgaten 35, Stockholm

Perfection



Hogging Cuts
and
Satin Finish

THE AMERICAN TOOL WORKS

LATHES

in both extremes

Roughing and Finishing— Hogging Cuts and a Satin Finish from the Same Machine

The rough portion of the surface is the result of a ¾″ depth of cut at 32 ft. cutting speed with a .070″ feed. Notice particularly the freedom from chatter. The smooth portion represents a finish cut with the same tool at the same cutting speed using .010″ power feed. Note the smoothness and regularity of the cut. The material is die steel, .50 carbon, .90 manganese and 1.09 chromium.

The new "American" Auto-Oiled Shaper surely represents the last word in shaper performance. The 24″ Shaper for example will transmit every bit of power a 10 horse power alternating current motor will deliver at full overload without the slightest slippage or stress. The same machine will take a finishing cut so smooth that a .004″ feed will produce a continuous hair chip the full stroke length—a satin finish!

Could Any Shaper Possibly Do More?

For higher quality of work.
For greater quantity of work.

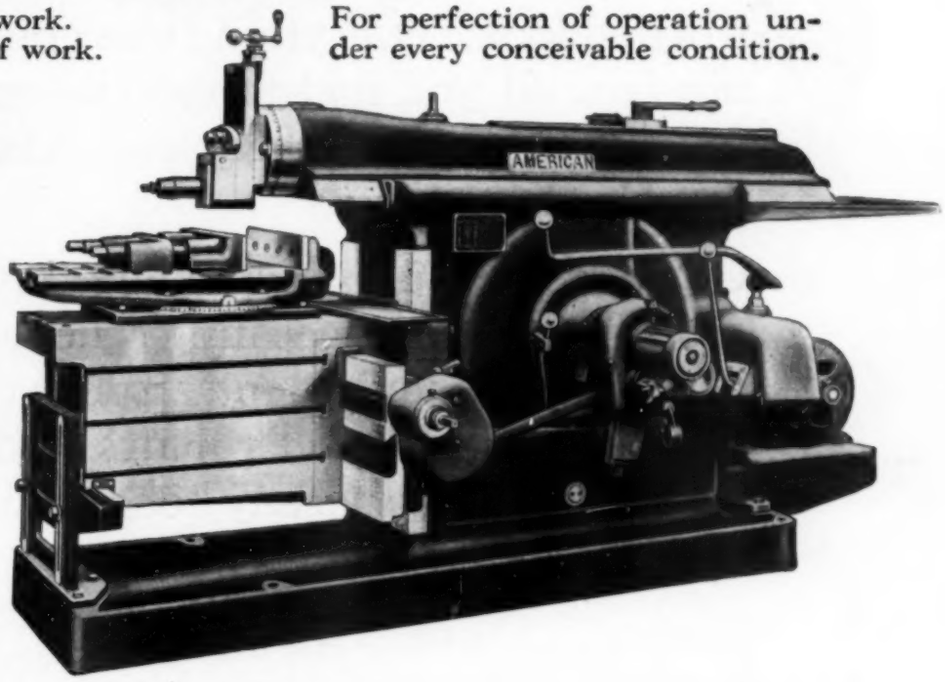
For perfection of operation under every conceivable condition.

The "American" Auto-Oiled Shaper

Is at your service.

One large concern cut out a very expensive scraping operation when "American" Auto-Oiled Shapers were put on the job.

If you are interested in such savings, write for catalog.



CO.~CINCINNATI, U.S.A

RADIALS • SHAPERS

Mr. Production Man

Are you using High-speed Gear Shapers?

If not, there is a good reason for that worried look. Everything was going along nicely until you had to cut the operating force and reduce schedules. Then your troubles began.

Of course, you cannot keep down unit costs on reduced operating schedules with "antiquated" equipment. Labor costs become excessive, and repairs and supervision charges dispel any hope of successful operation.

Happily, there is a solution to your immediate and puzzling problem. The solution is presented on the opposite page:

The solution is simple

Here it is:

Discard your obsolete gear cutting equipment and replace it with High-speed Gear Shapers. These machines will save you money, time and worry.

You will then be able to get your required volume with fewer operators, and you will also save in power, floor space, cutter costs, etc. In fact the High-speed Gear Shaper will soon pay for itself through the savings that it makes possible.

Large and small users alike, have proved this statement to their entire satisfaction and profit.

Send in blueprints of your gears to our Engineering Department.

Give them the opportunity to help you make greater profits.

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Works: 78 River Street, Springfield, Vermont, U. S. A.

Branch Office: 651 Book Bldg., Detroit, Mich.

FOREIGN AGENTS: Alfred Herbert, Ltd., Coventry, England—Great Britain; Alfred Herbert (India) Ltd., Calcutta and Bombay—India; Alfred Herbert, Ltd., Osaka and Tokio—Japan and China; Alfred Herbert (Australasia), Ltd., Sydney—Australia; Societe Anonyme Alfred Herbert, Paris—France and Spain; Societa Anonima Italiana Alfred Herbert, Milan—Italy; Societe Anonyme Belge Alfred Herbert, Brussels—Belgium and Holland; Bohm & Bormann, Berlin—Germany, Czecho-Slovakia and Austria; Aktiebolaget A. Bonthrom, Stockholm—Sweden, Finland and Norway; Mathey-Doret & Ferrer, Zurich—Switzerland.

PACIFIC COAST REPRESENTATIVE—Louis G. Henes, 75 Fremont St., San Francisco; 218 E. Third St., Los Angeles—California, Arizona and Nevada.

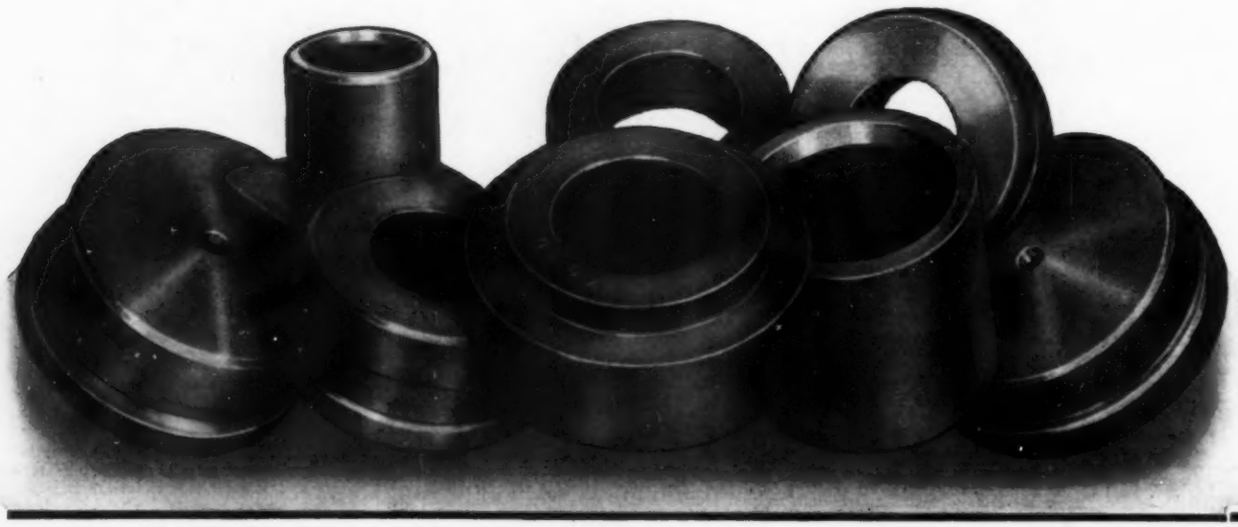
Proved in Perfo

TEN typical jobs—turning, boring, facing and similar operations—quantities from fifty to three hundred and fifty pieces for each set-up, previously required over four-hundred hours set-up plus production time.

These same jobs from the Six-Inch Four-Spindle Mult-Au-Matic have been produced in two hundred and eight hours, set-up plus production time.

This proves the flexibility of the Mult-Au-Matic Method in smaller quantity production. It is obvious that with larger quantities, the savings would be relatively increased.

If in doubt as to the savings the Mult-Au-Matic Method will make on the smaller parts you are now machining, just send sketches, prints or samples to Bullard Engineers for conservative estimates.



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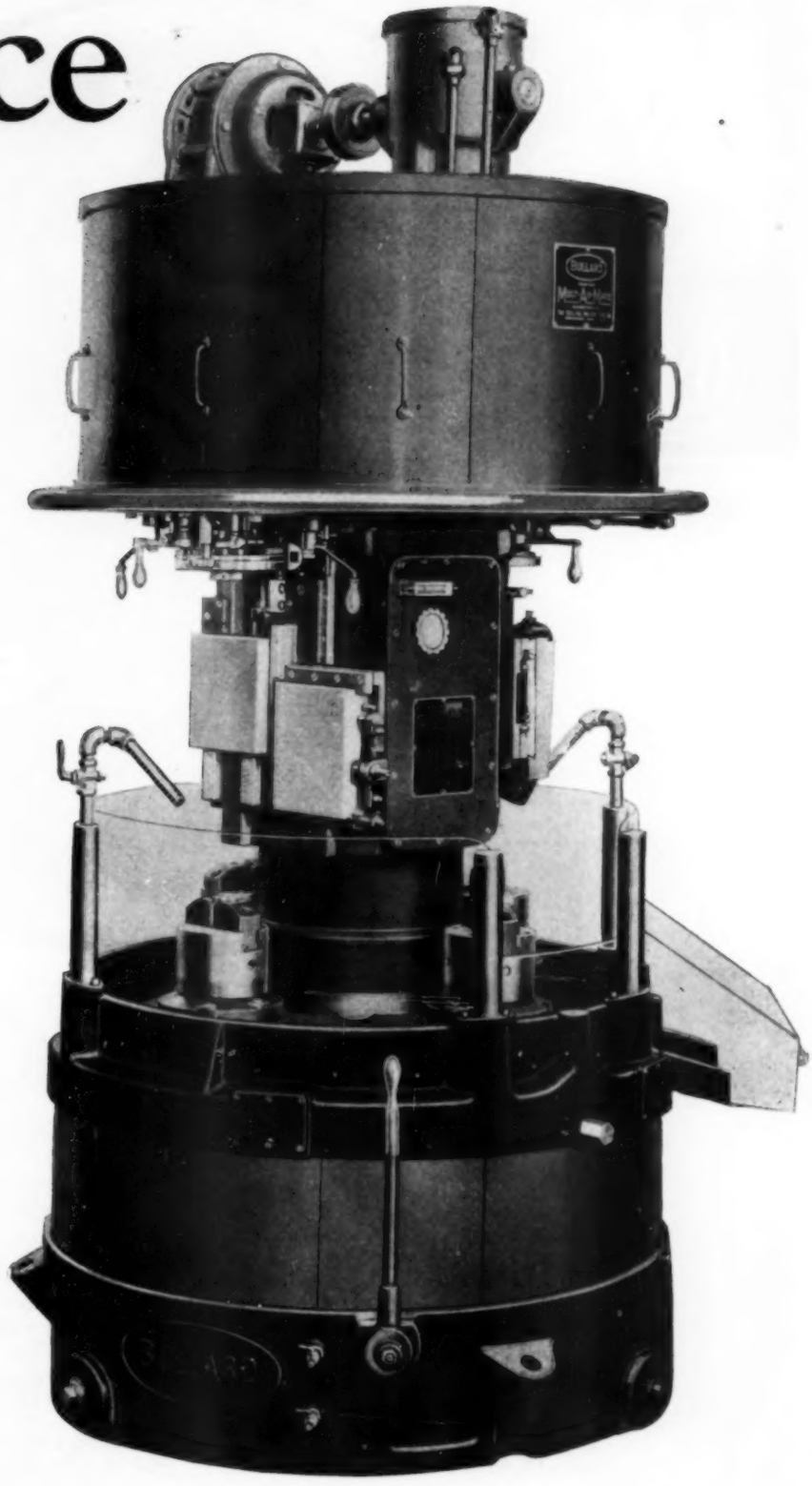


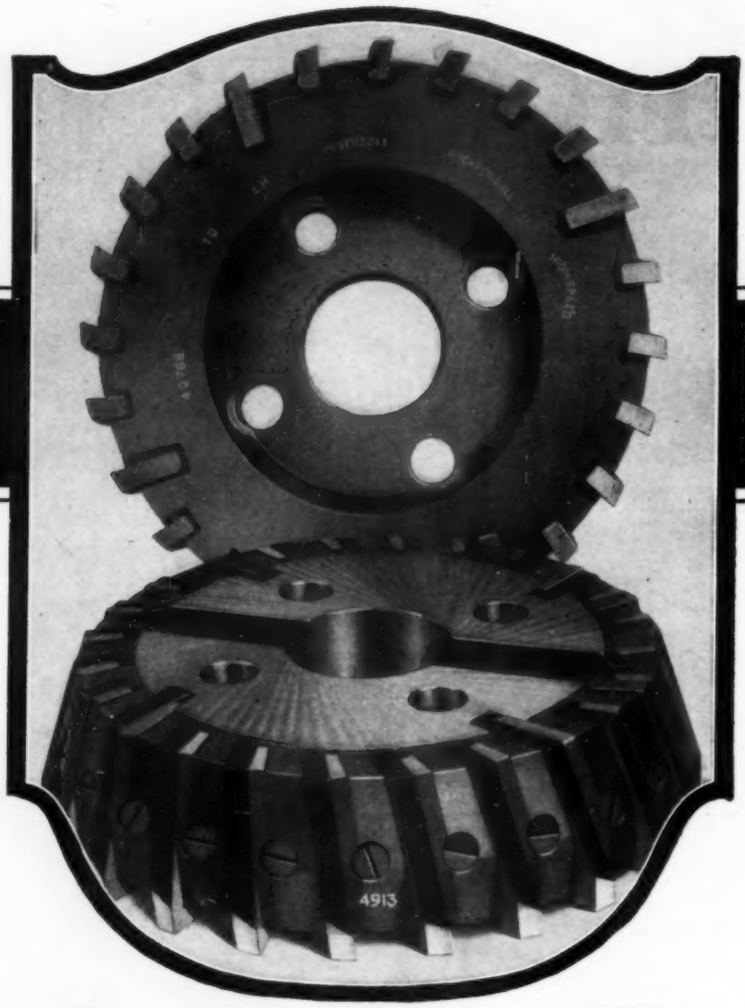
The

BULLARD

Machine Tool Co.

Bridgeport, Conn.

THE SIX-INCH FOUR-SPINDLE MULT-AU-MATIC



Ingersoll

FACE MILLING CUTTERS

The Ingersoll type R cutter has been developed for milling cast iron where the stock is not too heavy. The teeth are set close together, reducing the load per tooth and permitting faster milling of light sections.

The type R is one of the standard Ingersoll face milling cutters, which is carried in stock at Rockford for immediate shipment. The housing is a hardened forging and the high speed teeth are held by hardened wedges locked by screws. This method of clamping holds the teeth firmly for milling, but permits easy replacement when necessary. In addition, fully half the cutting metal may be used before replacement is required.

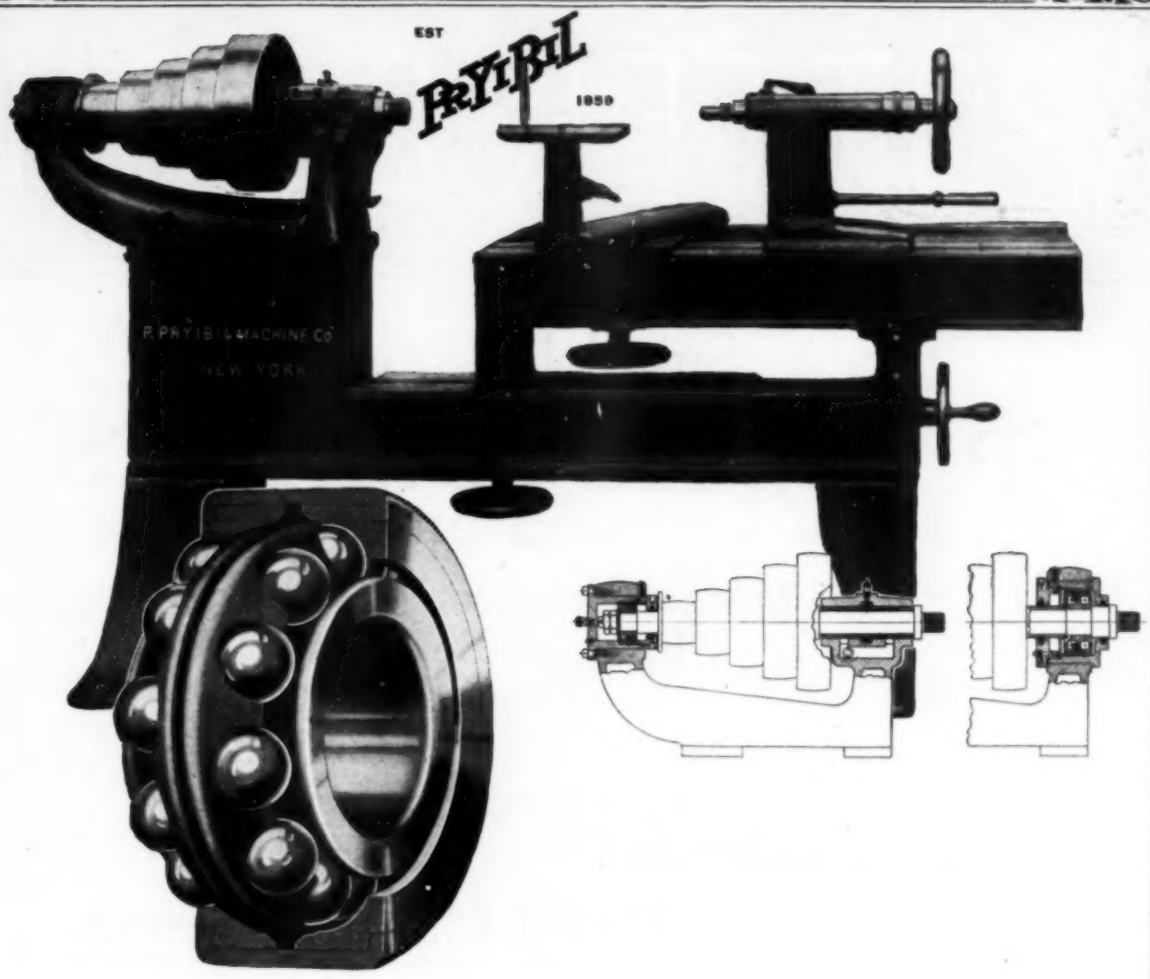
Bulletin No. 44 describes our standard cutters and some of the more special cutters which we build. We will be glad to send you a copy on request.

Write for Bulletin.

The Ingersoll Milling Machine Company

ROCKFORD, ILL.

Milling Machines and Their Equipment



"MANY makes of ball bearings have been tried in the rear bearing of our spinning lathe but to date we have found that the New Departure Ball Bearing is the only one that stands up under the heavy, continuous radial and thrust loads to which they are subjected" —say the P. Pryibil Machine Company, makers of the spinning lathe illustrated above. Another example of New Departure advantages.

Because of the quality of the steel, perfection of design and precision of manufacture, New Departures are practically frictionless and support shafts and spindles rigidly and *permanently* without decentering, without vibration and without measurable wear—hence without readjustment.

They require only infrequent lubrication and very little lubricant. They have longer life and are more economical than any other type of bearing.

A request will bring engineering data on "Ball Bearing Application," authoritative information and proven facts. Consultation with resident representatives quickly arranged upon request to the Bristol office. The New Departure Mfg. Co., Bristol, Conn., Chicago and Detroit.

New Departure Quality Ball Bearings

635

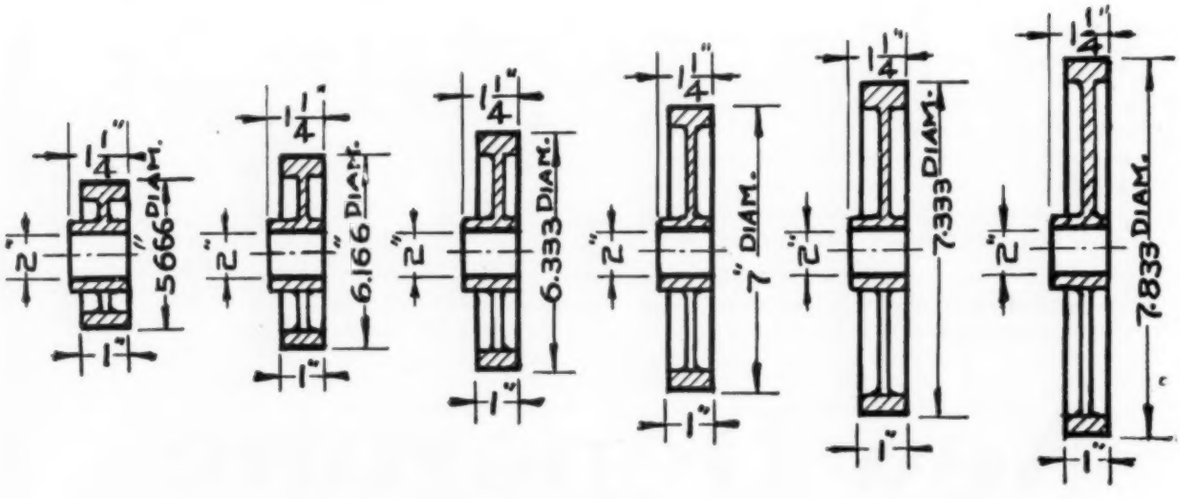
Small Lots on

P. & J. AUTOMATICS

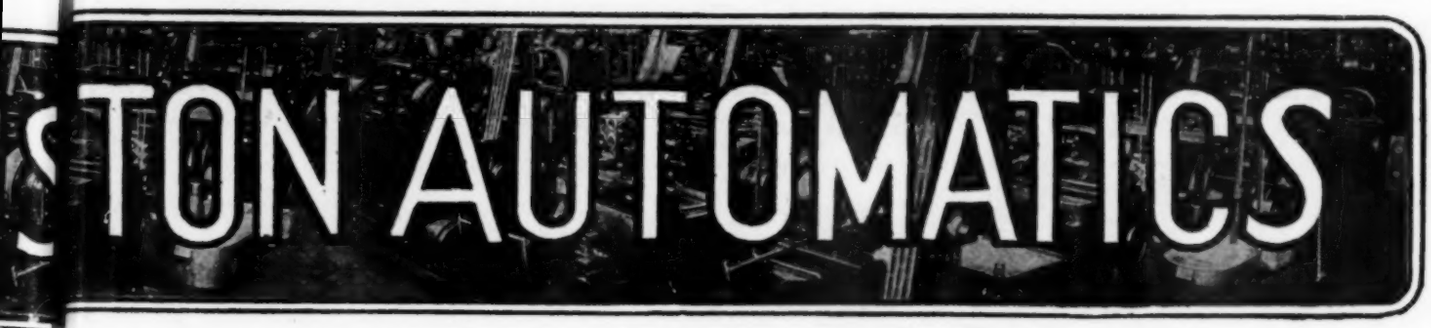
In Many Instances
They Can Be
Economically
Handled.

For Example:—

Hand Change Gears.



Quantities Required
Twenty-five of Each Size
Machine Recommended
Model 6 A-Automatic



CHANGE GEARS

The Several Size Gears Shown On The Opposite Page May Be Treated As One Lot of 150 Pieces

Why?

BECAUSE:—

All holes are the same size requiring no change in boring and reaming tools.

All gears the same face making it unnecessary to change adjustments of cross slide tools—simply move blocks out from center of cross slide to accommodate increase in diameters.

A quick change of turning tool diameters and a progressive increase in speed all that is required.

RESULT:—Economical Production

Let us have your prints for estimates.

POTTER & JOHNSTON

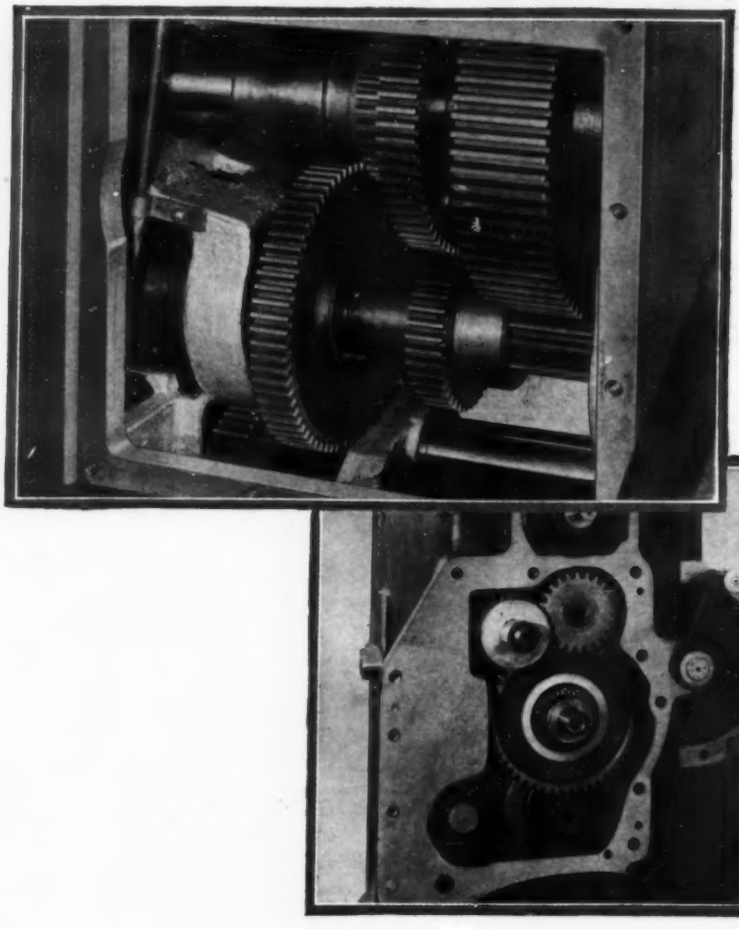
PAWTUCKET R. I., U. S. A.

DOMESTIC OFFICE: New York Office: 270 Madison Ave., Frank H. Robinson, Manager. Detroit Office: Potter & Johnston Machine Co., 3962 Cass Avenue. Chicago Office: 3057 Eastwood Avenue, Leslie J. Orr, Manager. Pacific Coast Offices: Louis G. Henes, 1418 Santa Fe St., Los Angeles, California; Louis G. Henes, 75 Fremont St., San Francisco, California. A. W. Stone, 986 Kenyon Avenue, Plainfield, N. J., Representative for Western New York State and Eastern Pennsylvania. J. P. Cunningham, Headquarters at Factory. Representative for New England. Louis K. Voelk, 910 Helmsdale Road, Cleveland, Ohio, Representative for Ohio and Western Pennsylvania.

CANADIAN REPRESENTATIVE. Arthur Jackson, 32-34 Front St., West, Toronto, 2, Ontario, and 437 Grosvenor Ave., Westmount, Montreal, Quebec. Automatics and Universal Shapers.

FOREIGN REPRESENTATIVES: L. J. Colomb, 68 Avenue de la Grande Armee, Paris, France, Representative for France, Belgium, Switzerland, Spain and Portugal. Charles Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Type, England, and Glasgow, Scotland. Ercole Vaghi, Via Parini 10, Milan (12) Italy. Maskinaktiebolaget Karlebo, Stockholm, Sweden. Yamatake Company, 7 Nakadori, Marunouchi, Tokyo, Japan. Schuchardt & Schutte, C-2 Spandauer Strasse, 28-29, Berlin, Germany, Representative for Germany, Austria and Czechoslovakia.

KEARNEY & TRECKER
MILWAUKEE MILLING MACHINES



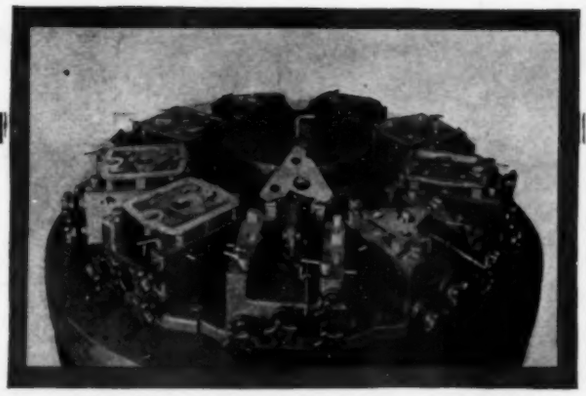
It means added years of life to your milling machines to have the

"SOLID MOUNTING"

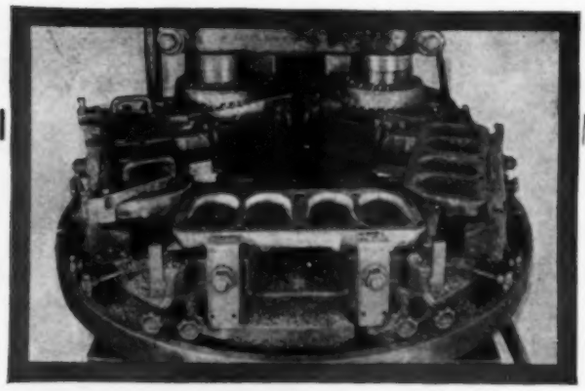
feature with all the shafts and the entire spindle gear train built into and within the column walls —not on a column plate bolted to the side.

This exclusive Kearney & Trecker feature means not only added years of life but also a more rigid spindle drive, less chatter of gears due to springing of mechanism under power, closer fitted gearing, more generous proportion of gear and shaft sizes because of the greater space available, larger bearings [Timkens throughout], and a more readily accessible mechanism constructed entirely from hardened alloy steels.

It is a self-contained, built up Milling Machine.



Face milling 50 Gas Meter Covers an hour.



Continuous face milling 225 Cylinder Heads in 8 hours.

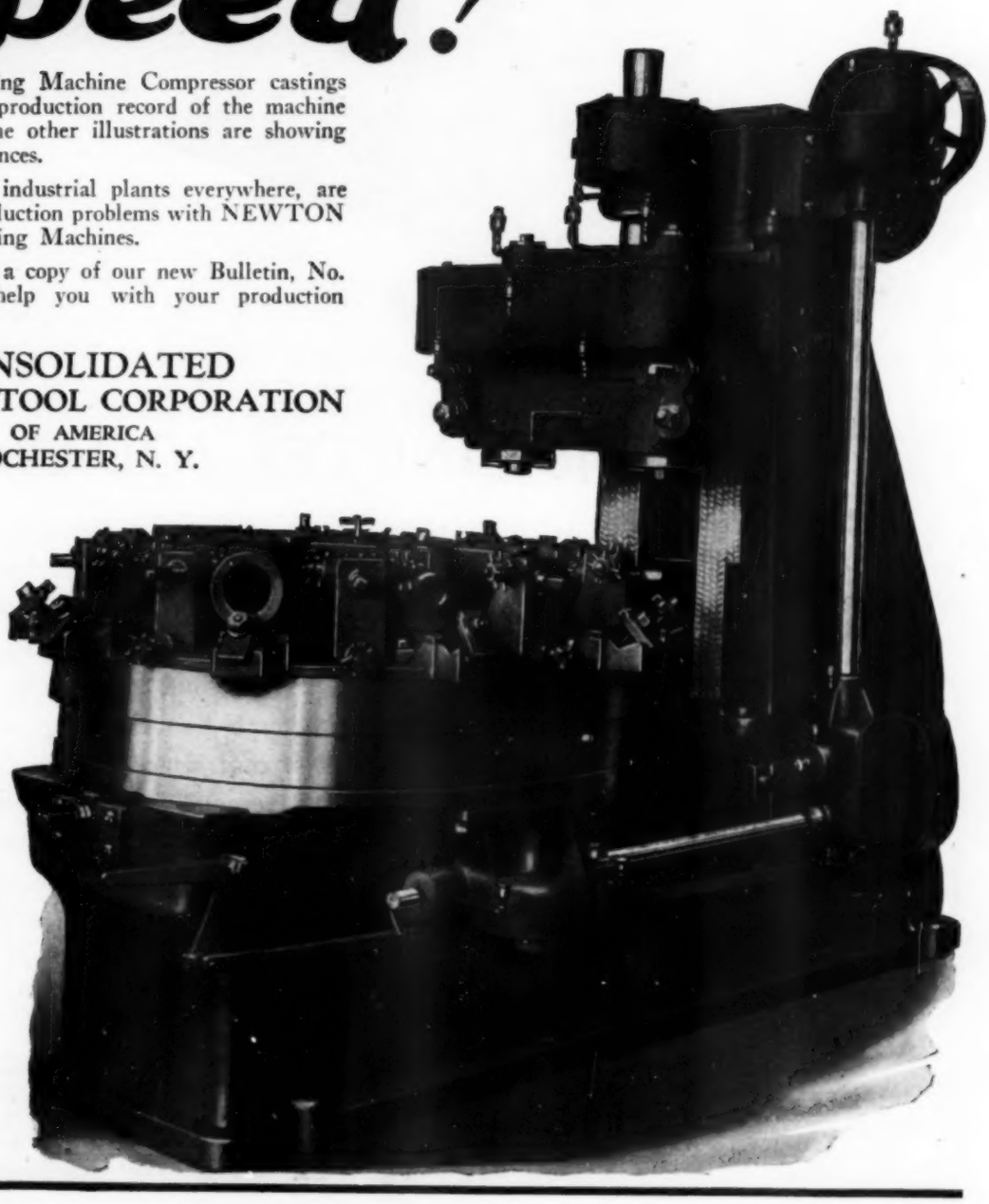
Speed!

Sixty Refrigerating Machine Compressor castings an hour, is the production record of the machine shown below—the other illustrations are showing similar performances.

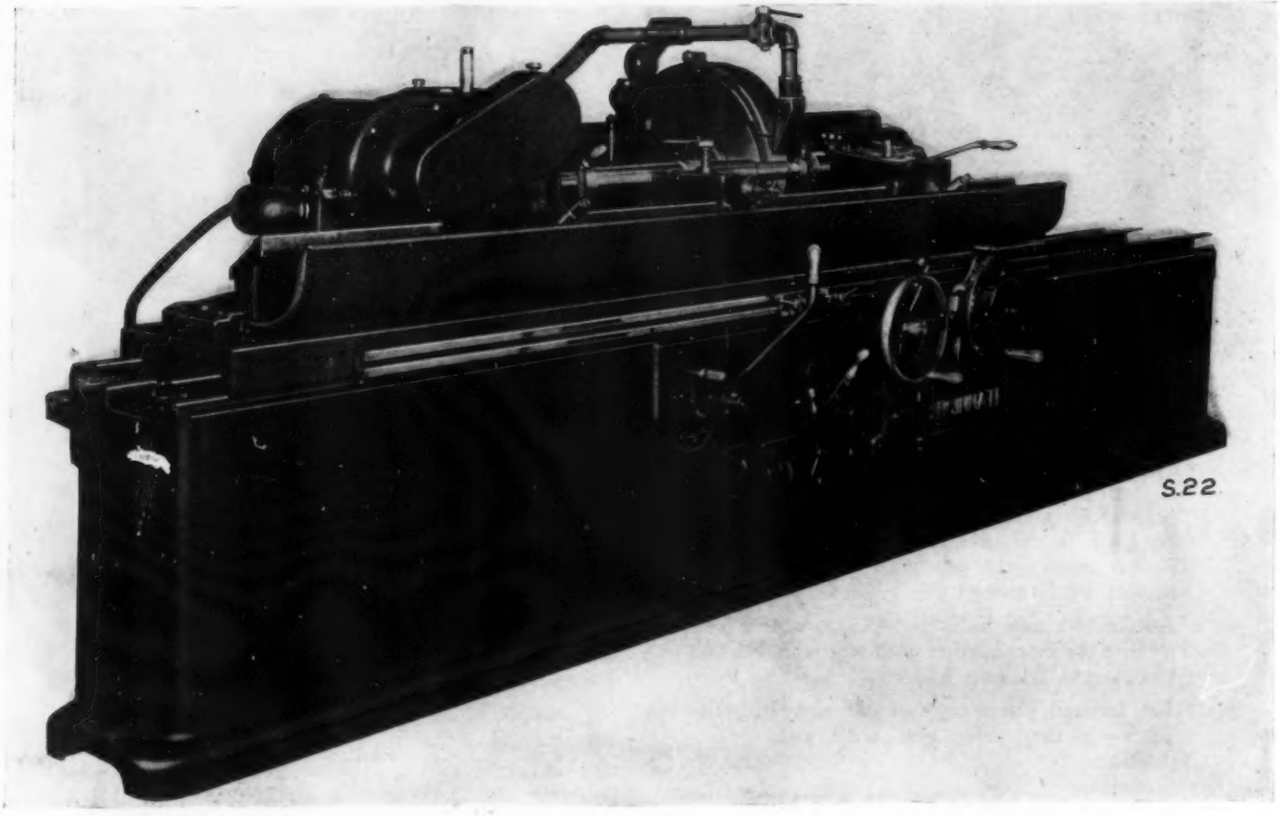
Automobile and industrial plants everywhere, are solving their production problems with NEWTON Continuous Milling Machines.

Let us mail you a copy of our new Bulletin, No. 58-A—it may help you with your production problem.

CONSOLIDATED
MACHINE TOOL CORPORATION
OF AMERICA
ROCHESTER, N. Y.

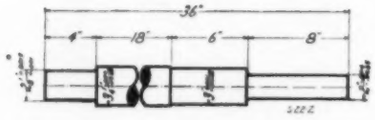


CONSOLIDATED MACHINE TOOLS



(Patented)

YESTERDAY 48 MINUTES--TODAY ONLY 20



Part Name—Armature Shaft.
Limits—Plus or Minus .0005 in.
Material—.35 Carbon Steel.
Stock Removed—.015—.020 in.
Finish—Excellent Commercial.
Time per Piece—20 Minutes.
Machine—Cincinnati 12 x 72-in. Grinder.

In the plant of a large manufacturer of elevators will be found this 12x72-in. Grinder as one of a battery of Cincinnati machines. A large variety of shafts, of which the one shown in the illustration and sketch is typical, is handled by this machine and similar savings are effected all down the line. The operator, through handling the machine quickly and easily as a result of centralized control can turn the jobs out fast. Rapid metal removal is obtained without chatter, due to the extreme ruggedness of construction of the spindle and machine. This installation is but one of many where users are enjoying a high return on their grinder dollar investment.

"A New Service with New Methods of Grinding"

CINCINNATI GRINDERS

What of Tomorrow?

Grinding practice is changing rapidly. Yesterday's methods will not do today, and it will pay to watch today's methods to make certain that new developments and new ideas are not overlooked.

The demand for the products of Cincinnati Grinders Incorporated has steadily increased. Ideas—careful attention to your problems—and a loyal interest in the performance of the machine after it is installed in your plant—have been factors creating this unusual demand.

We are constantly at work trying to improve our own methods, our own machines and in turn to apply these improvements to your work in your shop. Keep in touch with grinding machine progress. Are you on our mailing list to receive copies of our periodic publication—"Sparks?" We will be glad to send these to you with no obligation.

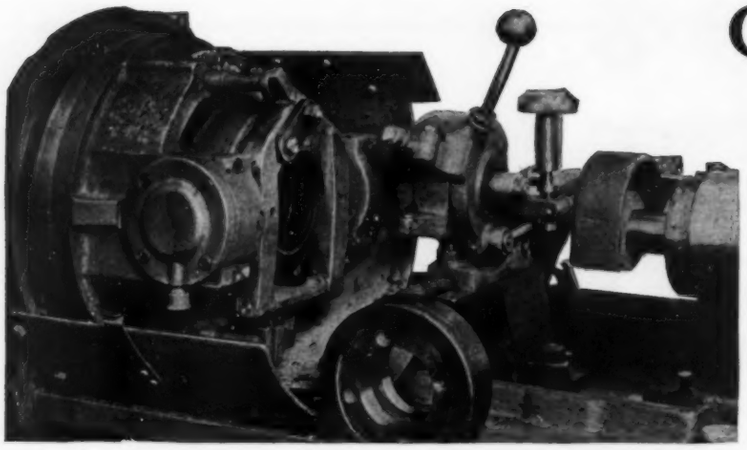
CINCINNATI GRINDERS
INCORPORATED
CINCINNATI, OHIO

CINCINNATI
MAKES MORE MACHINE TOOLS IN LARGER VARIETY THAN ANY OTHER CITY IN THE WORLD
TO SEE AN UP-TO-DATE MACHINE TOOL COME TO
CINCINNATI

WATCH FOR THIS EMBLEM

Wherever you see it Cincinnati Grinders have a production story to tell. Speed in operation and a willingness to adopt new ideas and new methods characterize our company and its products.

CINCINNATI GRINDERS



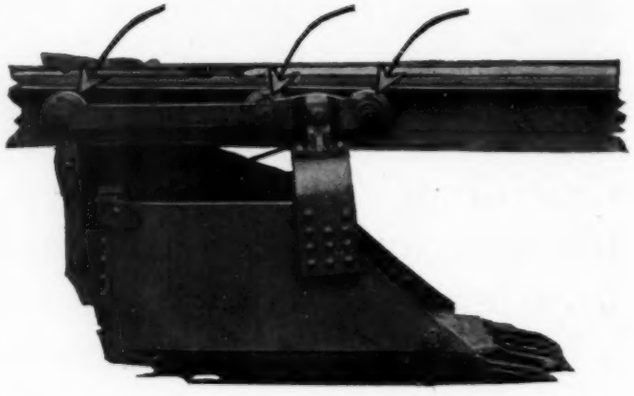
Grinding Holes At Both Ends

Single Setting

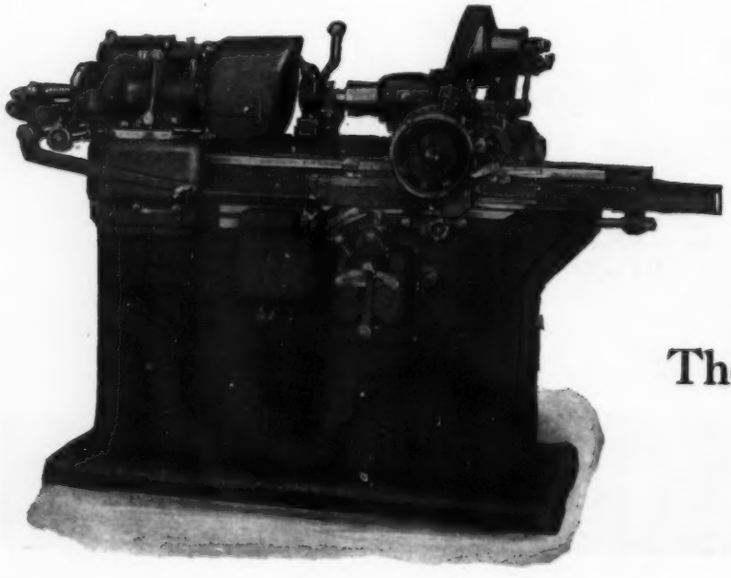
GRINDING to a shoulder the holes in both ends of a hardened steel scoop roll at a single setting with the Heald SIZE-MATIC Internal Grinding Machine.

Ball bearings are pressed into the hardened ground recesses and the rolls are used on a Keystone Drilling Company Excavating Shovel, as noted by the arrows in one of the accompanying pictures.

The work is held in a Heald revolving fixture, enabling the operator to grind the hole at one end, revolve the work, and grind the other without rechucking or resetting the machine in any way.



One of today's manufacturing conditions in all lines is the demand for hardened steel parts with ground holes and surfaces. Furthermore, the limits on the fits of revolving parts are being held closer and closer and which in most cases can only be obtained by grinding.

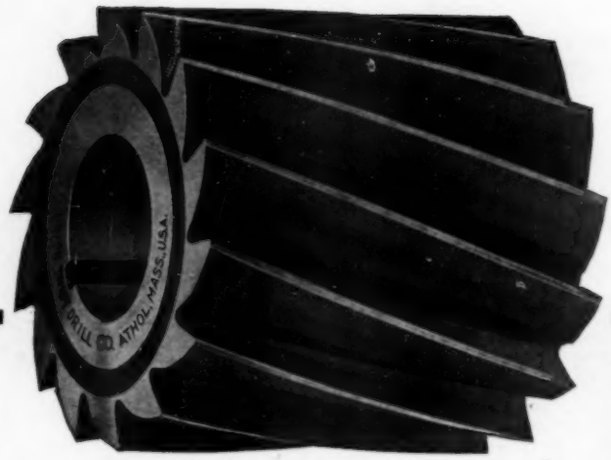


You may not be manufacturing equipment illustrated in this advertisement but if you have a hole to be ground or a surface to be finished, the chances are it can best be handled on a Heald.

The Heald Machine Co.

35 New Bond St.

Worcester, Mass.



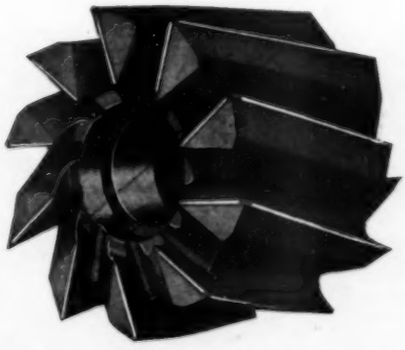
UNION
Milling Cutters

Longer cutting service between sharpenings is just one of the many advantages obtained by users of Union Milling Cutters.

Put Union Milling Cutters on your next long run, make a test of these tools which keep production up and hold costs down.

Standard types and sizes are carried in stock by all Union Agents.

End Mills and Shell End Mills



Union End and Shell End Mills are real profit makers, too!

Coarse Tooth Spiral Cut End Mills shown are stocked in all sizes for immediate delivery.

Spiral blades of the Shell End Mill insure a smooth shearing cutting-action.

UNION TWIST DRILL CO., Athol, Mass.

Makers of All Kinds of Cutters, Twist Drills, Reamers, Taps, Dies, etc.

Tools you buy again

Taps & Dies
S. W. Card Mfg. Co.
Division Union Twist Drill Co.
Mansfield, Mass.

Taps, Dies & Screw Plates
Butterfield & Co. Division
Union Twist Drill Co.
Derby Line, Vt. Rock Island, Quebec

AGENTS THROUGHOUT THE WORLD

Bigger and Better

The NEW No. 3

CINCINNATI
MAKES MORE MACHINE TOOLS IN LARGER VARIETY THAN ANY OTHER CITY IN THE WORLD
TO SEE AN UP-TO-DATE MACHINE TOOL EXHIBIT
CINCINNATI

ACME DUO-CONTROL FLAT TURRET LATHE

All the well-known "Duo Control" refinements are incorporated, plus the advantage of much greater capacity.

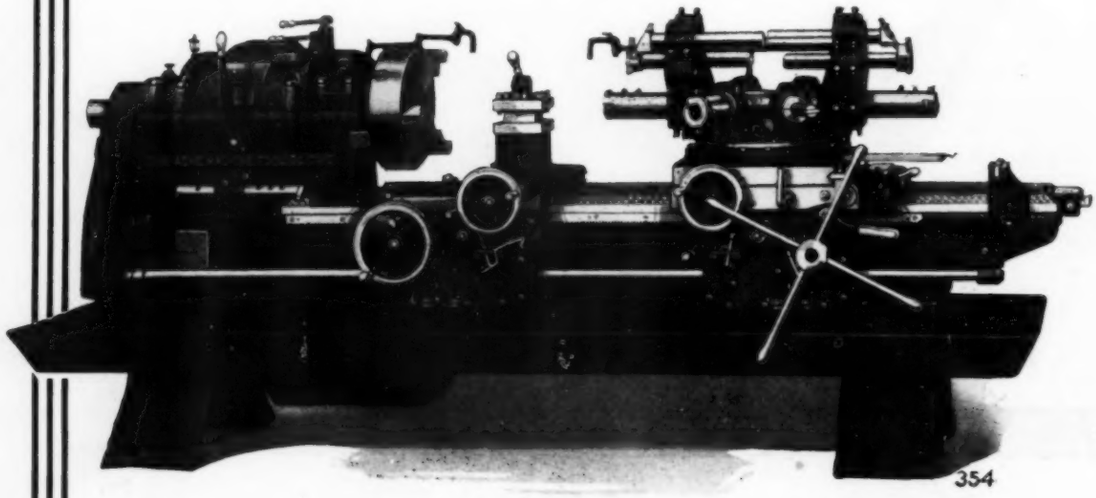
The New No. 3 Full Universal Turret Lathe with Duo Control is adaptable to both bar and chucking work.

It has a 3½-in.x44-in. bar capacity and a 15-inch chucking capacity.

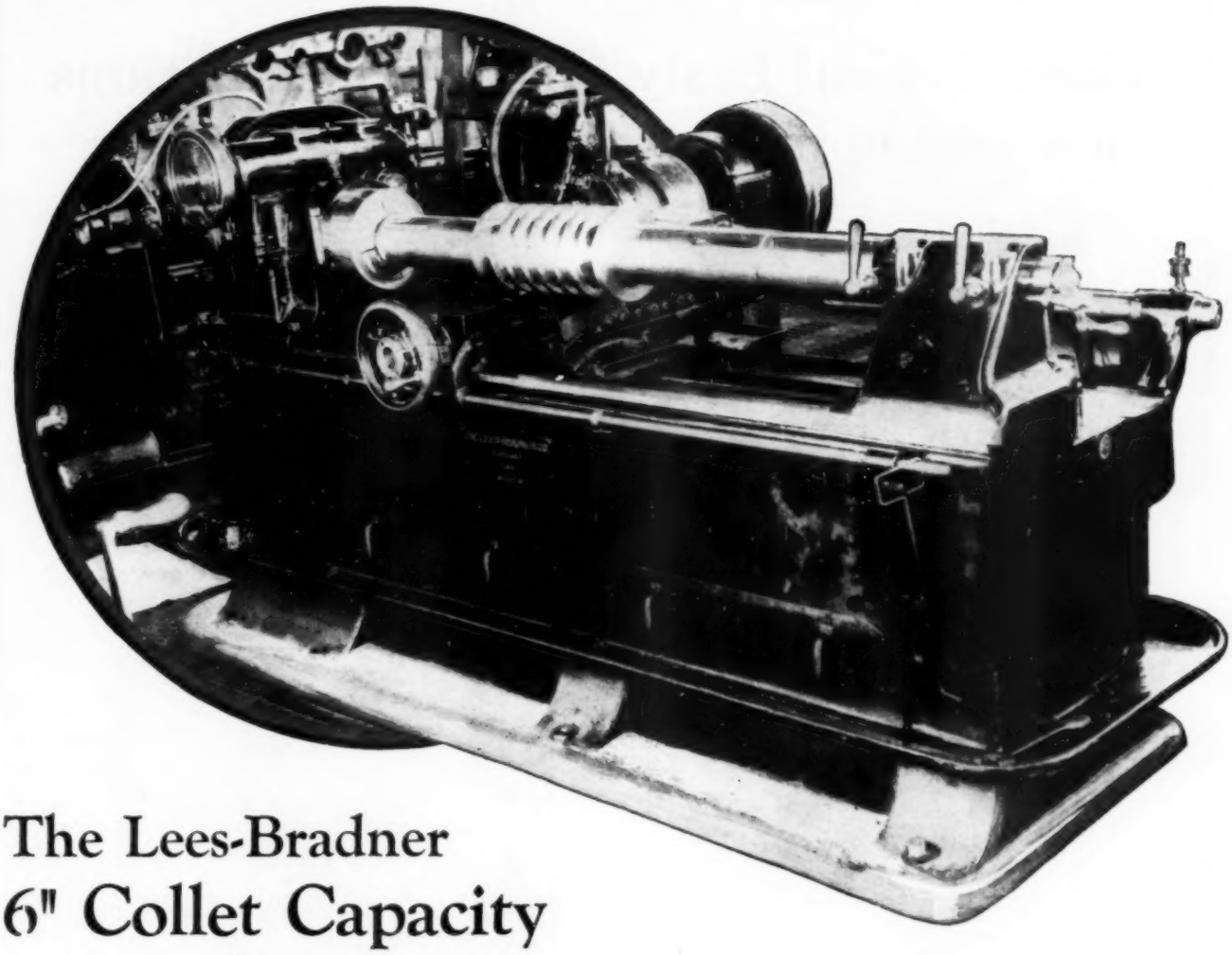
"Acme Duo Control" reduces operating fatigue—the last hour of the day's run is just as productive as the first.

Cross feeding turret feature permits quick "set-up"—machine proves as economical on variety jobs as it is on large lots of duplicate parts.

Write for complete specifications of the New No. 3 Acme Duo Control Turret Lathe.



The Acme Machine Tool Co., Cincinnati, Ohio



The Lees-Bradner 6" Collet Capacity Heavy Type Thread Miller

STOP
AT
BOOTH 324
NATIONAL
MACHINE TOOL
BUILDERS'
EXPOSITION
SEPT. 19-23
CLEVELAND PUBLIC
AUDITORIUM

This machine, which mills single or multiple threads up to 2½" circular pitch in steel, cuts the labor cost of heavy threaded work to a remarkable degree over any other method of producing the thread, and at the same time correct form of thread and excellent finish are maintained.

Work of indefinite length and up to 6" diameter can be handled through the work spindle and gripped in the collet, the outer end being supported by the tailstock, either on the center or extending through a bushing.

The swing over the carriage is 12", and therefore large diameter worms with shanks up to 6" diameter, similar to the work shown in the illustration, are produced with dispatch.

The Lees-Bradner line of Thread Millers is complete, producing from the finest threads to 2½" circular pitch in steel, single or multiple threads, and any lead up to 100".

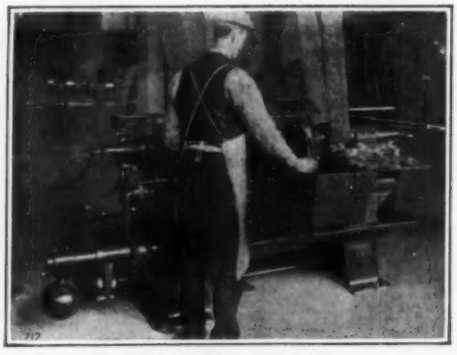
Used Everywhere.

The Lees-Bradner Co.

Cleveland, Ohio

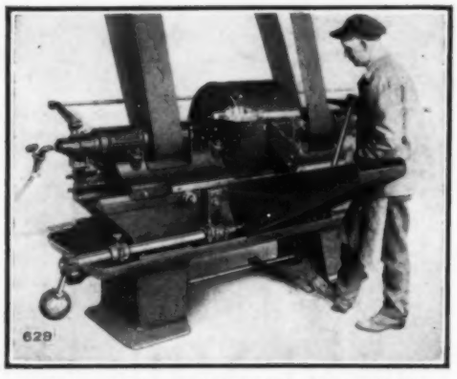
Gear Grinders
Gear Testers
Gear Hobbers
Thread Millers

These typical Besly Grinder installations are saving money for the other fellow

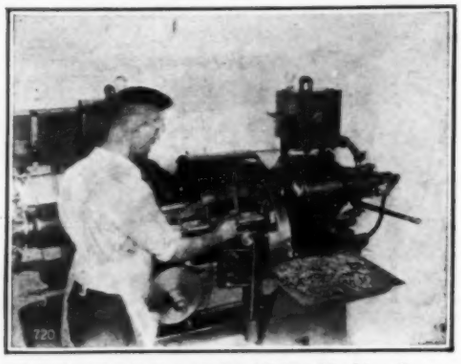


Grinding Parallel Two Sides of Two Wrenches at a Time
Production 200 to 400 per hour

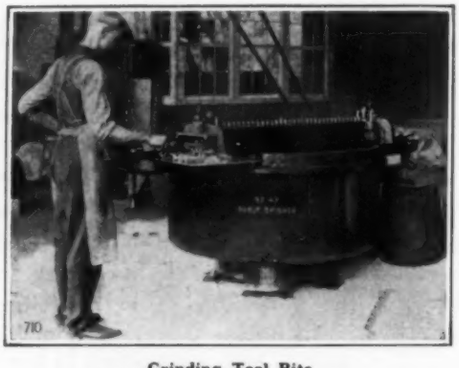
Grinding Both Ends of Conduit Boxes at Once,
2040 per hour



Grinding High Speed Steel Die Chaser Blanks,
700 per hour



Grinding Small Parts Like Adding Machine Gears
3500 per hour



Grinding Tool Bits
Production 4 sides, 500 per hour

Finish Grinding to Size One Side of Steel Rings,
3000 per hour

Why not for you?

CHARLES H. BESLY & COMPANY
121 No. Clinton St., Chicago, Ill., U. S. A.

How would your inventory stack up against this?

A few startling facts

The following figures have been published recently from the inventory of one railroad.

The average age of their locomotives is from 18.7 to 44 years.

Average age of freight train cars 16.3 to 27 years.

152 caboose cars average 42.9 years.

444 composite passenger cars average age 21.8 years.

604 wood passenger cars average age 35.7 years.

1344 passenger cars all kinds average age 24.2 years.

A subsidiary of the same railroad has 38 composite and wood cars with an average age of 36.7 years.

IT is a fairly safe assertion that the rolling stock of any railroad is better cared for than repair and machine shop equipment.

Think, then, of conditions in the average railroad repair shop. We know of many Niles tools that are from 30 to 50 years old.

If railroad repairs were made on a competitive basis it would be imperative to scrap these obsolete tools. Day in and day out they are wasting money compared with the results to be obtained by modern tools.

Ask someone in your organization to give you a list of major machine tools with their ages. Perhaps you would be astonished at the revelation. Here may be a source of loss, an absolute waste of profits that could be stopped.

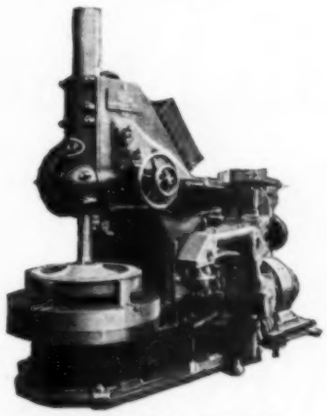
We will gladly send an experienced engineer to help you in determining what could be done to supply you with more profitable machines.

The Niles Tool Works Company

Division Niles-Bement-Pond Company

Hamilton, Ohio

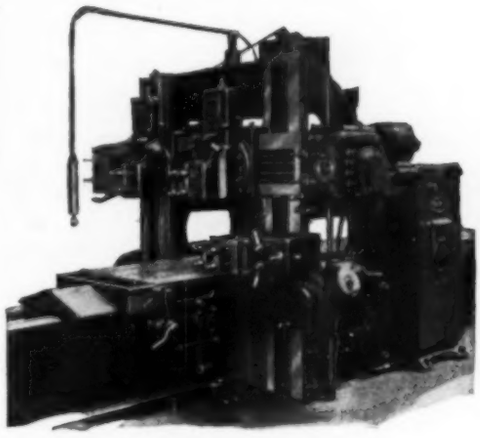
A FEW MODERN NILES MACHINES



CAR-WHEEL BORER

TIME SAVER LATHE

NO. 4 CAR WHEEL LATHE



TIME SAVER PLANER

Sales Offices

BIRMINGHAM	PHILADELPHIA	LOS ANGELES	SAN FRANCISCO	PITTSBURGH
CLEVELAND	BOSTON	ROCHESTER	CHICAGO	DETROIT
	CINCINNATI	ST. LOUIS	NEW YORK	

Why Try to Remember Details?

Can you remember essential details on all of the new shop equipment that has been put on the market since the first of the year—or even on those units which are of particular interest to you?

It is hardly fair to expect you to recall more than general facts, even though you actually do need the details.

And so that you may have all this needed information without having to remember, the editors are assembling the items for you.

They will appear in the *American Machinist* Semi-Annual Shop Equipment Review and Catalogue Number.

July 21, 1927

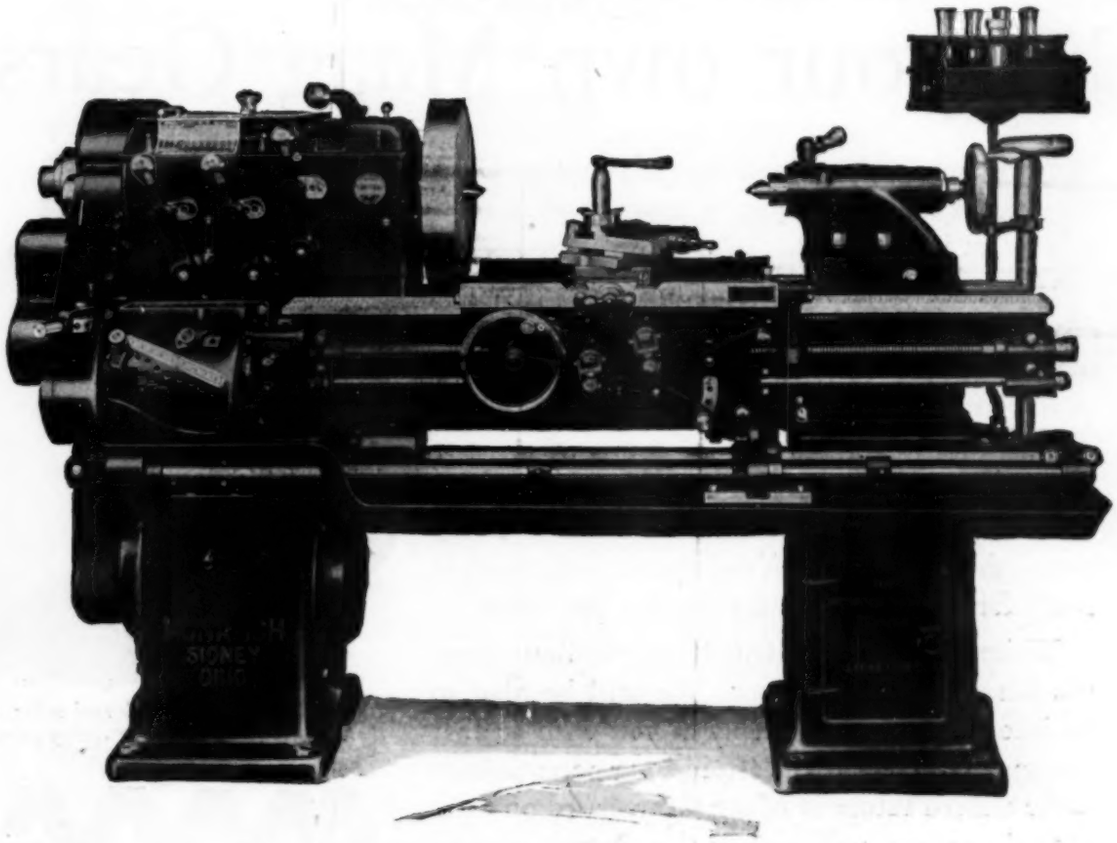
Why

MONARCH Helical Geared Lathes

cut production costs

1. Helical Headstock Gears. Silent, Smooth, Powerful. No gear tooth marks on work.
2. Fast changes of spindle speeds.
3. Fast, non-slipping apron feed control levers. (Patented).
4. Multiple disc clutch, dual control, instant starting and stopping of spindle.
5. Centralized controls, operator handles all controls without moving from his normal working position.

Only in Monarch Helical Geared Lathes Are All These Essential Features Found

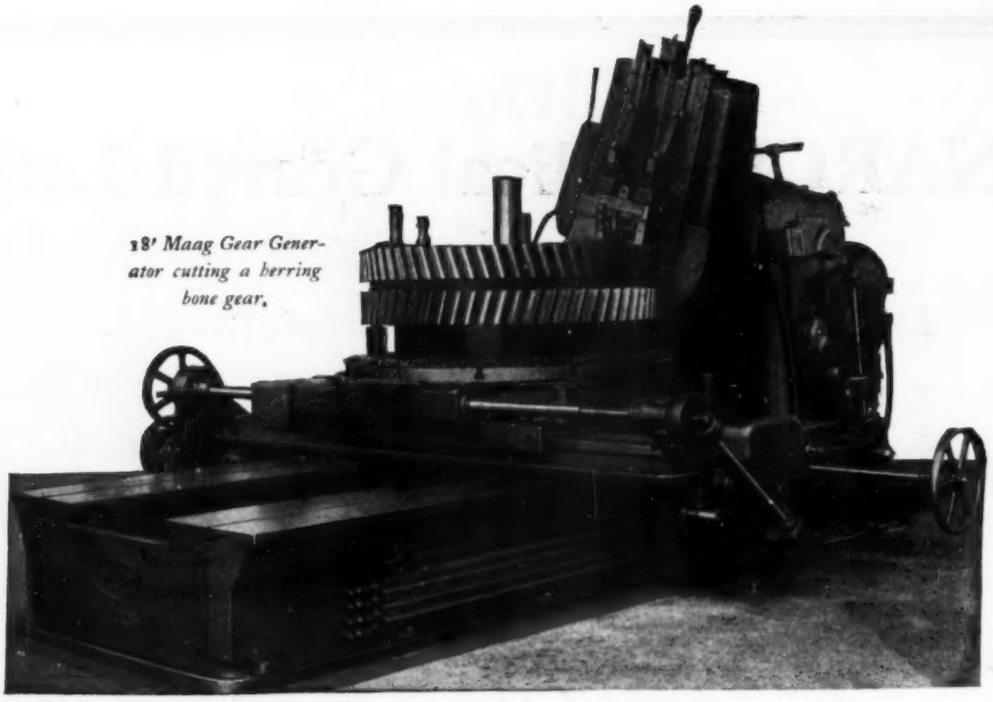


16-in. x 6-ft. Monarch Helical Geared Complete Tool Room Lathe

Silent — Smooth — Powerful

THE MONARCH MACHINE TOOL CO.

Sidney, Ohio NEW YORK OFFICE, 857 Graybar Bldg.



18' Maag Gear Generator cutting a herring bone gear.

Cut your own Maag Gears

We are now able to sell to you Maag Gear Generators for the cutting of gears from 1 inch to 40 feet in diameter.

If you are thinking of starting a gear cutting department, or of re-vamping your present department, do not fail to investigate the possibilities of the Maag Gear Generator.

This machine generates gears directly from a rack shape cutter, producing a more accurate gear than is possible with other machines. Maag Gears, though made with the theoretically perfect tooth form, are cut rapidly on this generator.

Write to us for detailed information about the Maag Gear Generator. We will be glad to go into the subject as deeply as you wish so that you may understand the astonishing potentialities —the assured future of Maag Gears based on their proved success.

This is the basic straight side rack cutter— the most accurate tool made for cutting gears.

Niles Gear Company
Division Niles-Bement-Pond Company
111 Broadway, New York

MAAG GEARS

From our 1876 *Catalog*

THERE isn't much difference in appearance between some of the taps we made in 1876 and our 1927 models. But there is a difference of fifty years' experience that affects every tiny particle of steel.

Our men have attended our own steel school during all these years and none is ever graduated with a complete knowledge. Our "professors" are still scholars with minds wide open for new methods of steel treating that will put even more wear into our taps than they have now.

Sometimes it seems that we are trying for the impossible. We have records of nut taps that have tapped more than 200,000 nuts—but we are still trying to make them better.

Some of our processes, developed in our own plant, are still unknown to others. Whether these processes, or our long experience, is responsible does not matter much to you.

Your interest lies in the quantity of work our taps will do, the quality of the work and above all, the low cost per hole tapped.

We know of no taps that have come anywhere near equalling records made by P & W on actual production work—which means we know of none *that will earn so much money* or save as much for you.

Pratt & Whitney's word has been as good as a bond for many long years. We give you that word on the savings to be made by P & W Taps, and ask that you believe us to the extent of testing our taps against any others you are using.

From our 1927 *Catalog*

PRATT & WHITNEY CO., *Hartford, Connecticut*
Division NILES-BEMENT-POND COMPANY

PRATT & WHITNEY

BIRMINGHAM PHILADELPHIA ST. LOUIS LOS ANGELES SAN FRANCISCO
CLEVELAND BOSTON ROCHESTER CHICAGO
PITTSBURGH DETROIT CINCINNATI NEW YORK

LANDIS

ANNOUNCING

The Self-Contained Universal Grinder

with

A variable speed motor driven combination live and dead spindle headstock.
Positive headstock drive (worm and worm gear).
Electrical speed change for work head.
A motorized grinding wheel head (universal).
Wheel spindle drive from end, through double "V" belts.
Automatic cross feed to wheel head.
Traverse motor mounted on rear of water tank.
Friction speed change for traverse drive.
Centralized control.

An inquiry will not obligate you.

DOMESTIC AGENTS: Hallidie Machinery Co., Seattle; Smith, Booth, Usher Co., San Francisco and Los Angeles; Peden Iron & Steel Co., Houston; Fulton Supply Co., Atlanta; F. C. Richmond Machinery Co., Salt Lake City; Moore-Handley Hardware Co., Birmingham; Seifreat-Elstad Machinery Co., Dayton and Cincinnati; Syracuse Supply Co., Syracuse, Rochester and Buffalo; Stedfast, Roulston, Inc., Boston.

Landis Tool Company

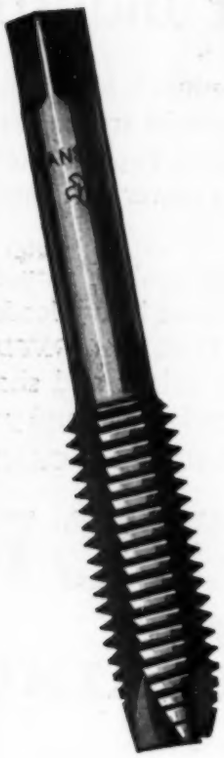
Waynesboro, Pa.

New York Office: 2907 Singer Bldg.
Detroit Office: 5928 Second Blvd.
Chicago Office: 618 W. Washington Blvd.

FOREIGN AGENTS: R. S. Stokvis & Zonen, Rotterdam; R. S. Stokvis & Fils, Paris, and Brussels; Anderson, Meyer & Co., Ltd., Shanghai; Andrews & George Co., Ltd., Tokyo; Benson Brothers, Sydney and Melbourne; Burton, Griffiths & Co., Ltd., London; Wilh. Sonesson & Co., Malmo and Copenhagen.

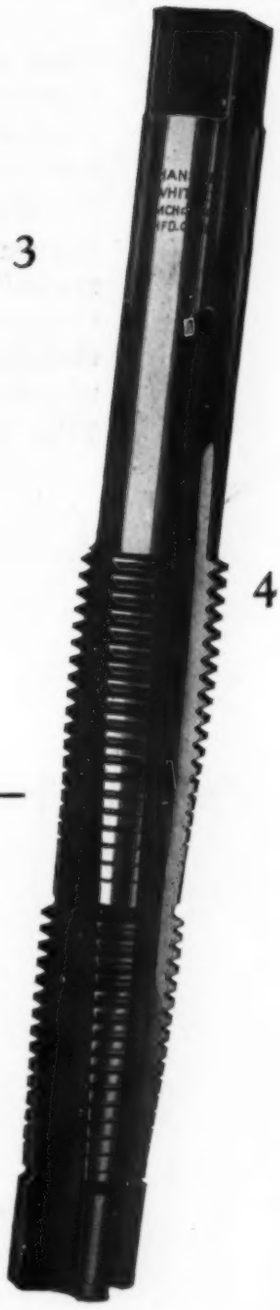
CANADIAN AGENTS: F. F. Barber Machinery Co., Toronto; Williams & Wilson, Ltd., Montreal.

1



Tap for No. 2 Holder

3



4

Meeting Every Tapping Need—

There are numerous Tapping jobs that can be met to better advantage with a specially developed design.

Here we show four different designs; all standard; all finished-after-hardening by the Hanson Process and guaranteed accurate to .0001 in.

(1) "SHEAR-CUT" — a Hanson-Whitney design developed for use on tough materials like drop-forging, Tobin-bronze, etc. Especially suitable for automatic screw machine use. The continuous, steep spiral flutes provide a shearing cut the entire length of the flutes.

(2) "SHEAR-POINT" — a type of "production tap" where the first few teeth are undercut to provide a shearing cut. This tends to force the chips ahead.

(3) To those who prefer the Beaman & Smith method of driving a tap, Hanson-Whitney offers a complete line.

(4) TANDEM TAPS. A patented exclusive Hanson-Whitney design, invaluable in certain difficult tapping operations, or where a superior finish is desired. Embraces two distinct taps in one—a roughing and finishing section.

Write for the Hanson-Whitney catalog showing complete line of Standard and Special Taps, Gauges, etc.

"HANSON" PROCESS

The Hanson-Whitney Machine Company

HARTFORD, CONN., U. S. A.

Domestic Representatives: New York, N. Y., L. C. Bigelow & Co., Inc.; Syracuse, N. Y., George McPherson; Philadelphia, Pa., D. J. Normoyle; Pittsburgh, Pa., William K. Stamets; Cleveland, Ohio, William K. Stamets; Cincinnati, Ohio, Seifreat-Elstad Mchy. Co.; Dayton, Ohio, Seifreat-Elstad Mchy. Co.; Detroit, Mich., A. G. Brice; San Francisco, Calif., A. H. Costes Co.; Chicago, Ill., E. H. Huntington; Toronto, Ont., Canada, Arthur Jackson.

Foreign Representatives: London, England, Leo C. Steinle; Rotterdam, Holland, R. S. Stokvis & Zonen, Ltd.; Stockholm, Sweden, Rylander & Aspiund, Maskinforsaljning A-B; Paris, France, Fenwick Freres & Co.; Turin, Italy, Fenwick Freres & Co.; Brussels, Belgium; Fenwick Freres & Co.; Barcelona, Spain, Fenwick Freres & Co.; Rio de Janeiro, Brazil, Fenwick Freres & Co.; Zurich, Switzerland, Fenwick Freres & Co.; Tokyo, Japan, Andrews & George Co.; Sydney, Australia, H. P. Gregory & Co., Ltd.

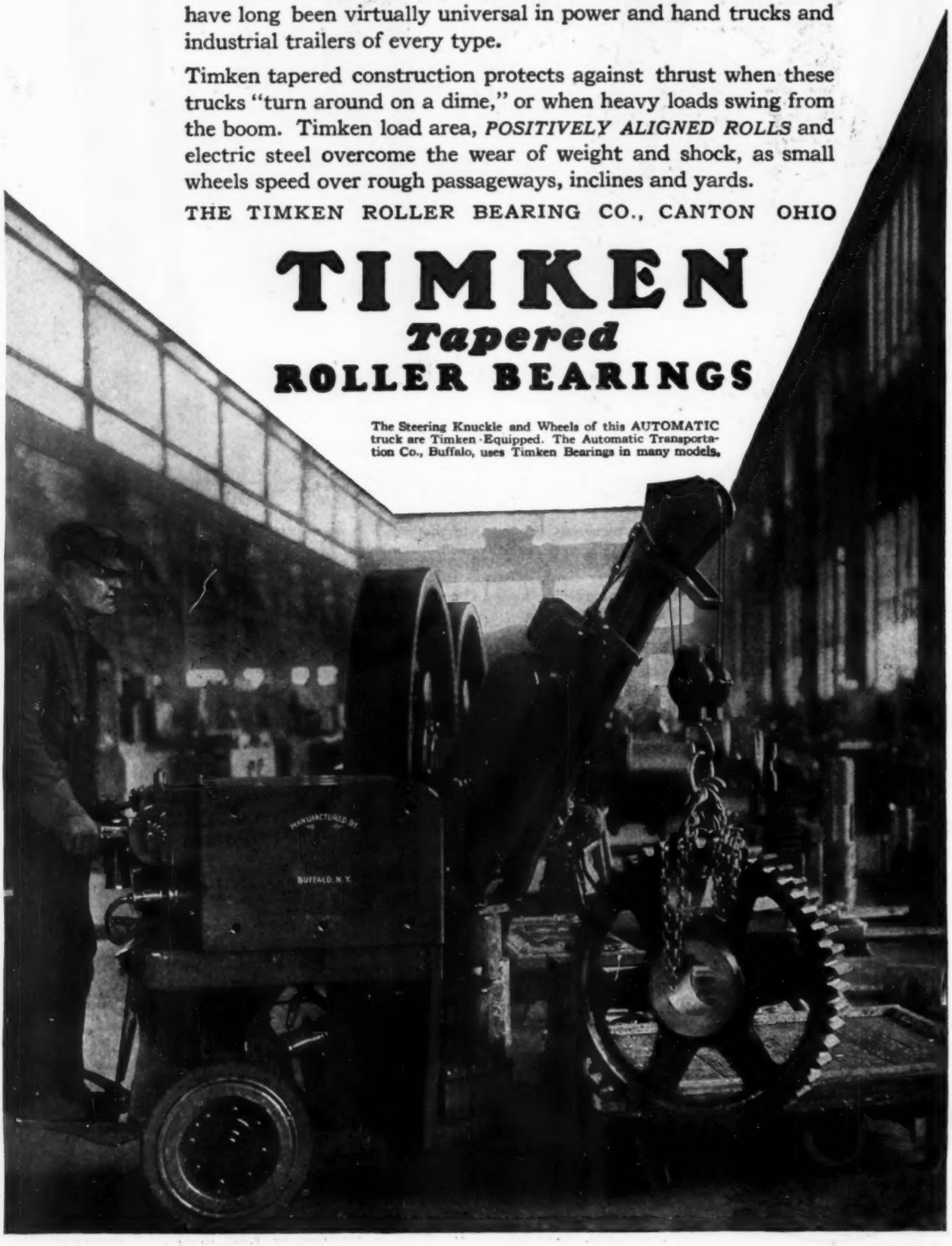
Enduring, Economical, Fast Industrial Trucks

Labor and power are saved, risk is reduced, and damage to floors is prevented when the wheels of industrial trucks are easy-rolling and true-running. That is why Timken Tapered Roller Bearings have long been virtually universal in power and hand trucks and industrial trailers of every type.

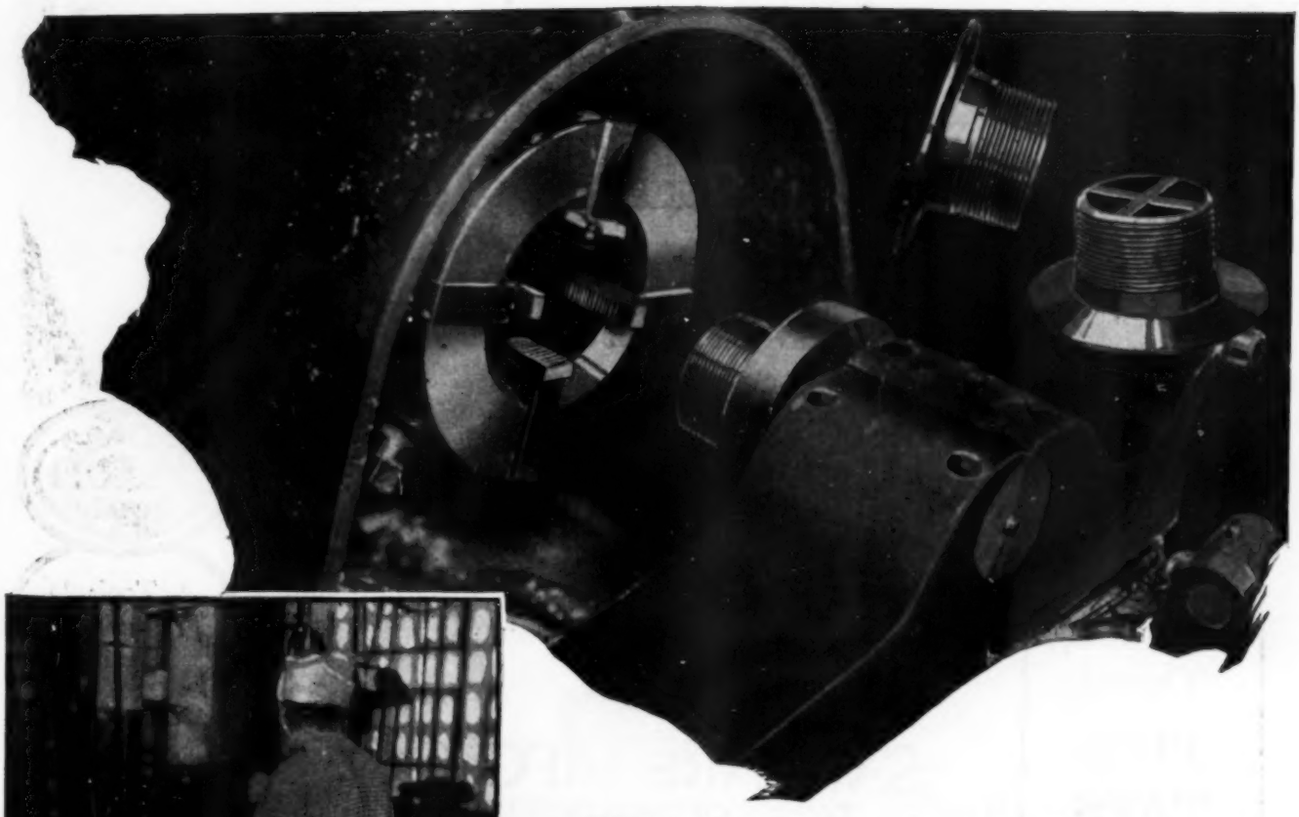
Timken tapered construction protects against thrust when these trucks "turn around on a dime," or when heavy loads swing from the boom. Timken load area, *POSITIVELY ALIGNED ROLLS* and electric steel overcome the wear of weight and shock, as small wheels speed over rough passageways, inclines and yards.

THE TIMKEN ROLLER BEARING CO., CANTON OHIO

TIMKEN
Tapered
ROLLER BEARINGS



The Steering Knuckle and Wheels of this AUTOMATIC truck are Timken-Equipped. The Automatic Transportation Co., Buffalo, uses Timken Bearings in many models.



High production on an inexpensive machine

The Ireland & Mathews Manufacturing Company formerly threaded pressed brass waste strainers on a hand screw machine, experimenting with various makes of die heads.

Production, with this method, was 200 per hour.

Two years ago they installed a No. 4 Geometric Threading Machine equipped with a Geometric Style C Die Head and production immediately rose to 300 pieces per hour.

Here's the point in this case: The Geometric equipment cost only from 1/3 to 1/4 as much as the hand screw machine, yet produced threads of a better quality, at a higher rate.

The threads on these strainers are 1-5/8-in.—16 x 1-1/4 in. long.

General Manager Ireland says, "Our Geometric Equipment is most economical. It produces high quality threads with unskilled labor. We get from 125,000 to 150,000 pieces with one set of Geometric Chasers.

"We have tried almost all makes of self-opening die heads and collapsible taps and have found Geometric Tools to be the best for our work—general plumbing supplies."

Your profits are governed by your equipment. If your threading costs are too high, Geometric Tools will give relief.

Also manufacturers, for more than 30 years of the well-known Geometric line of Collapsing Taps. If it can be threaded, Geometric has the tool to do it.

GEO MET RIC

Right from the Lead

The Geometric Tool Company

Westville Station **New Haven, Conn.**

Better results all around—

A plant equipped to thread 3,000 malleable iron pieces per day used carbon steel pipe taps running at 35 to 40 surface feet per minute.

CARD High Speed Steel Ground Thread Taps were introduced and operated at 90 to 125 surface feet per minute.

With the same number of operators, production was increased to 13,000 pieces per day and a better quality of finished work was obtained.

Let us show you how to improve results all around, just write for complete list of sizes and prices.

CARD
High Speed
Steel
Ground
Thread
PIPE
TAPS

The CARD Quality

Tools You Buy Again

TAPS
Screw Plates
Dies

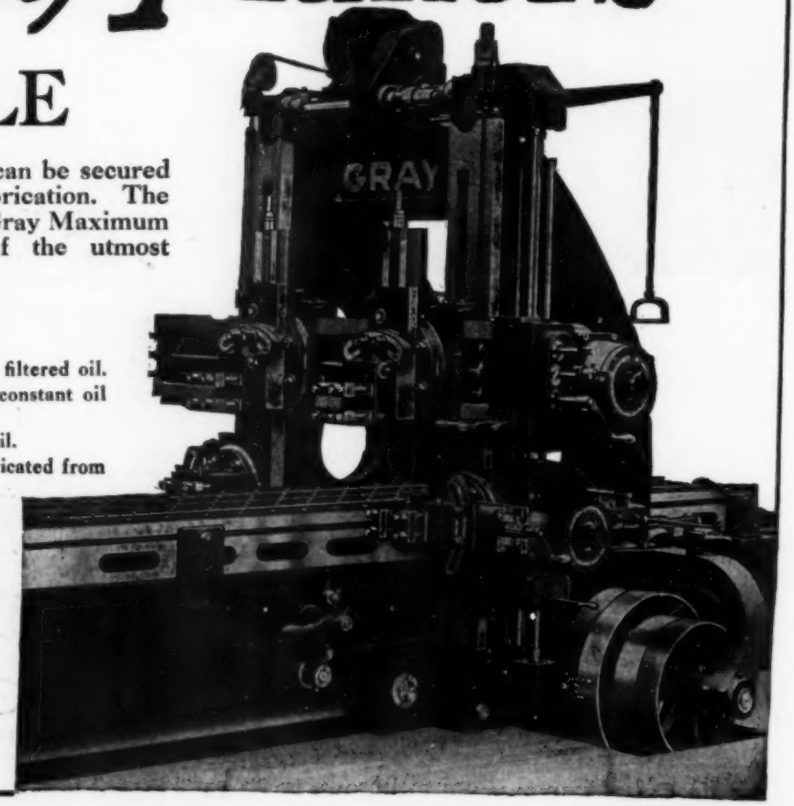
S. W. CARD MFG. CO.
DIVISION OF UNION TWIST DRILL CO.
MANSFIELD, MASSACHUSETTS, U.S.A.

Gray Planers

DURABLE

Long life and freedom from wear can be secured only by adequate and unfailing lubrication. The following features incorporated in Gray Maximum Service Planers are therefore of the utmost importance:

1st. V's are flooded with filtered oil.
2nd. Gears run in a bath of oil.
3rd. Driving shaft bearings are flooded with filtered oil.
4th. Gray Pressure Relief Valve maintains constant oil pressures.
5th. Feed and rapid traverse gears run in oil.
6th. Rail, side heads and top works are lubricated from centralized oil reservoirs.

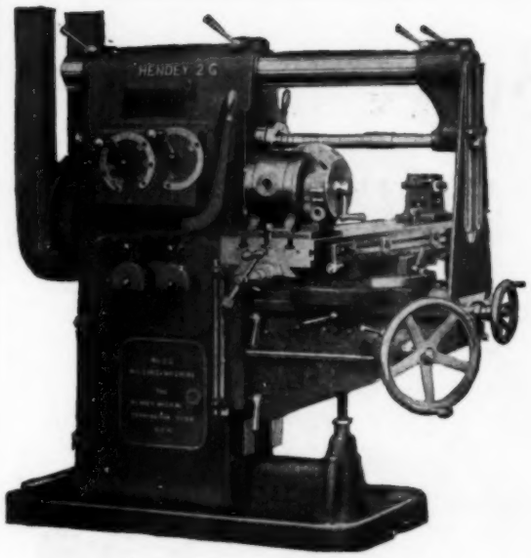


May we tell you of the many other features that make Gray Maximum Service Planers so easy to take care of and such big producers?

Write for our Illustrated Catalog

THE G. A. GRAY CO.
CINCINNATI, OHIO

Manufacturers of Maximum Service Planers:
Open-side and Double-Housing



Built to add lustre to a name already famous

Hendey Milling Machines are designed by Hendey engineers, built complete in the Hendey shops by mechanics long trained to Hendey's high standards of workmanship.

A pedigree that is sufficient guarantee in itself. This is not said in a boastful spirit, but only so far as pride of name reflects a wholesome appreciation of how hard a good name is to get, how easy to lose, how precious to maintain.

With their powerful single pulley drive, they make certain that the metal-removing capacity of modern high speed steel milling cutters will be utilized to the fullest degree.

With weight properly distributed and generous support at the wear points, they ably meet the extremely varying conditions of shop requirements, whether for heavy cutting or fine finishing.

The many reasons why Hendey Millers are found in so many of the leading shops are fully explained in a bulletin—sent to anyone upon request.

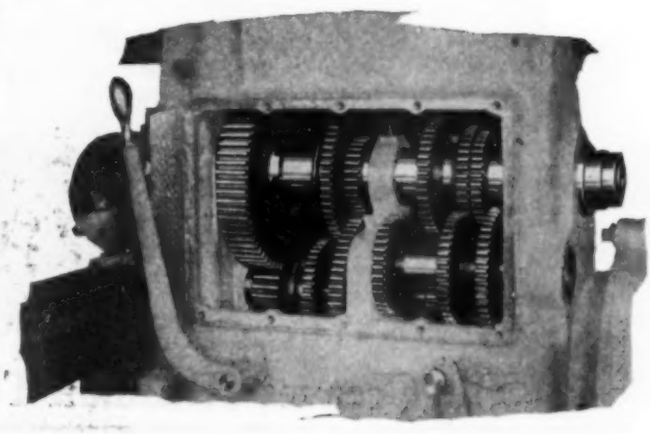
LATHES
SHAPERS

HENDEY
MACHINE CO., TORRINGTON, CONN.

MILLING
MACHINES

A Compact Spindle Speed Unit Ball-Bearing Mounted

giving 18 progressive spindle speeds, 15 to 355 R.P.M.—through two levers. Mounting the short gear shafts on ball bearings eliminates friction, simplifies design, and greatly extends profitable life of machine. Gears of alloy steel, heat-treated, deliver full power for long years of hard service.

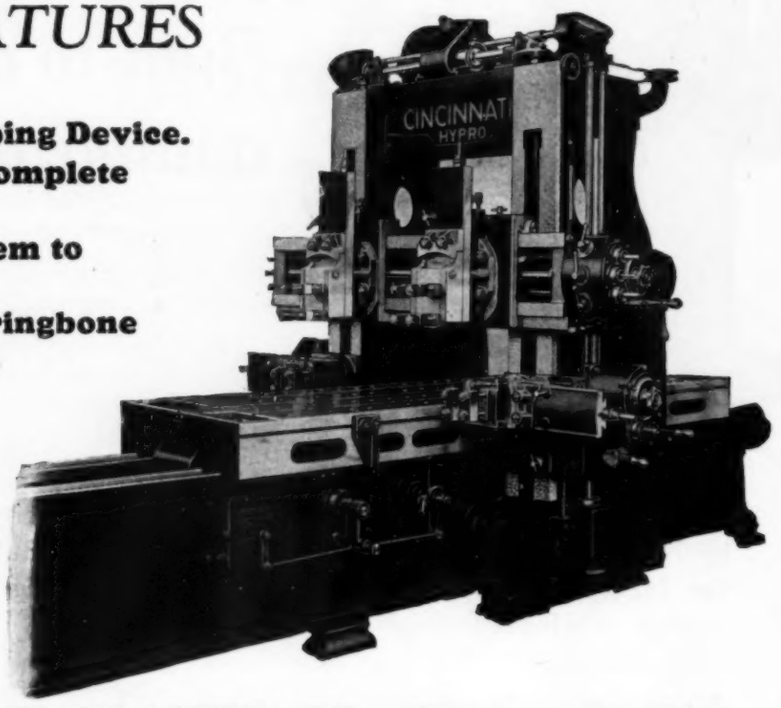


JUST A REMINDER

HYPRO FEATURES

Selective Dial Feed.
Single Turn Rail Clamping Device.
Spray Lubrication to complete Gear Train.
Centralized oiling system to Rail and Side Heads.
Combination steel Herringbone and Spur Gear Drive.
Steel Rack.
Full Depth Box Arch.
Straight Line Clapper Box.
Full Bearing Inverted Dovetail Down Slide.

Get Our Story.



THE CINCINNATI PLANER CO., Cincinnati, Ohio

G-K Single Lever Control

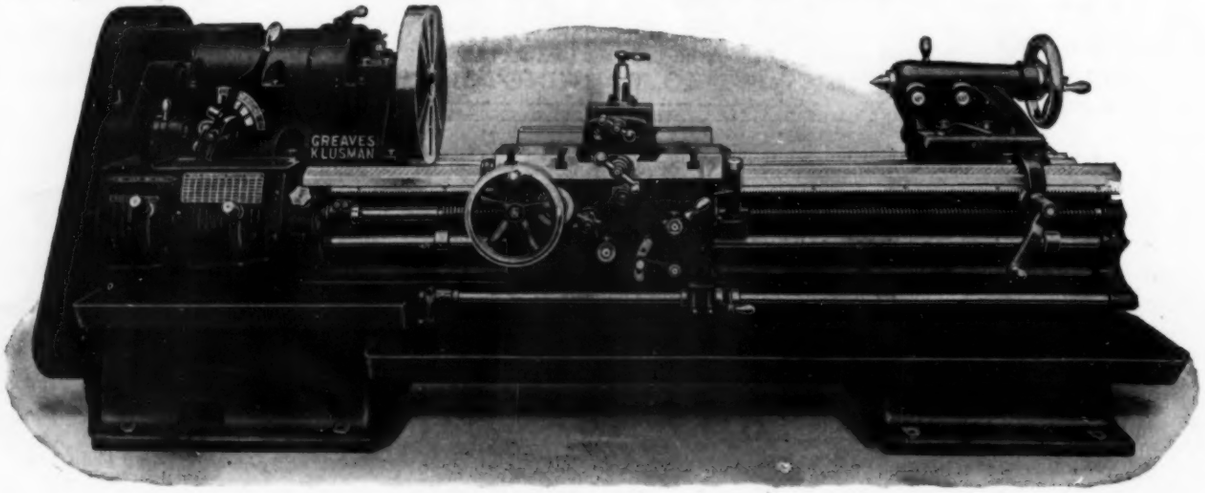
The G-K Single Lever Control permits of any one of the wide range of spindle speeds to be selected instantly —with one lever. It is the feature that makes a new man as efficient as an experienced operator.

It produces more work with less effort, minimizes machining losses and thus lowers cost per piece.

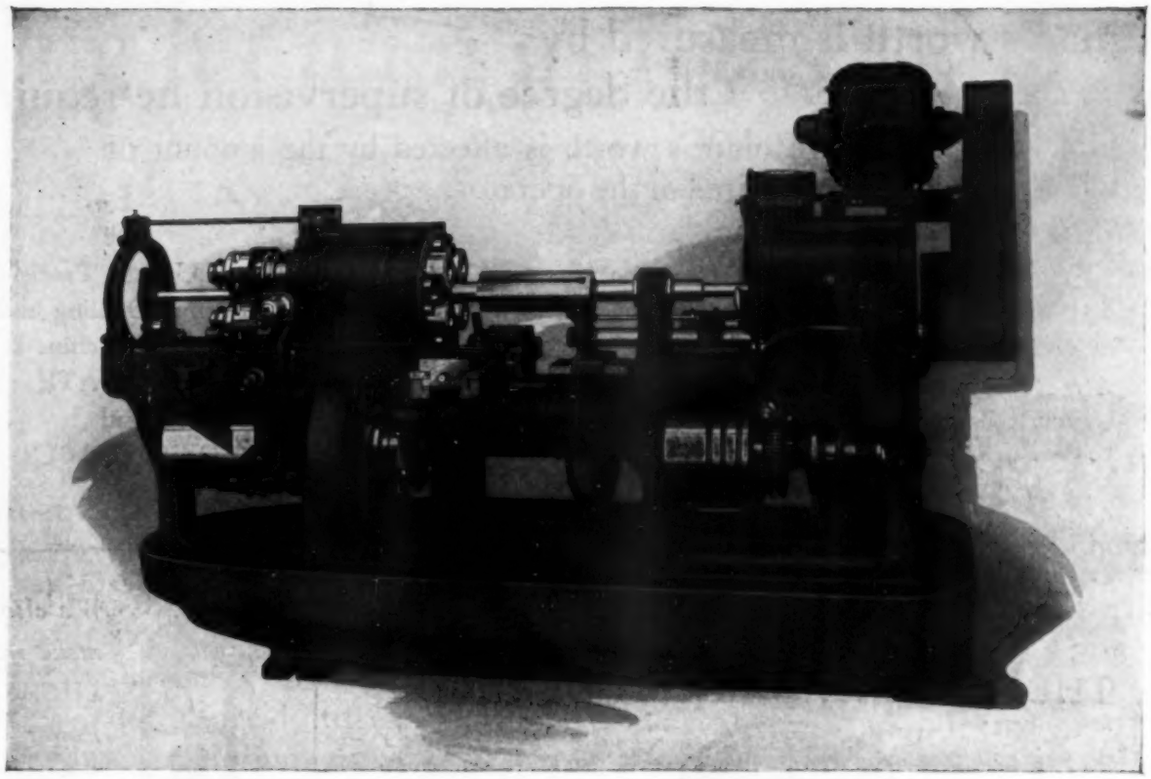
G-K Lathes, possessing a minimum number of operating levers, retain their accuracy over long life under severe conditions.

Designed in two types of motor drive—motor in leg, and motor on headstock.

G-K Single Lever Control Lathes are a decided advance in tools of this type. You will agree after reading the details in the Circulars.



The Greaves-Klusman Tool Co., Cincinnati, Ohio



Design of the Model "B" Acmes Cuts "Idle Time" to the Minimum

When the practical limits of spindle speed and tool feed are reached in the design of an automatic there usually still remains a big opportunity for cutting down the production time per piece. This opportunity—which has not infrequently been overlooked, lies in the reduction of idle time —that is, the time required for withdrawing the tools, for indexing and for feeding out the stock.

For many years experienced engineers on the staff of The National Acme Company have been devoting fully as much attention to reducing "idle time" as they have to increasing speeds and feeds. The highly successful results of their work in both these directions are embodied in the new 4-Spindle Acmes, Model "B."

While the productive movements of these new Acmes are carried out at remarkable speed, the idle movements can almost be described as "'lightning-like." They are also synchronized to a high degree and thereby save still more time.

With all this, provisions have been made to avoid the vibration and shocks which too frequently attend the action of large high speed mechanisms and rack them to pieces in a short time. Revolving parts are carefully balanced. Uniformly accelerated and retarded motion is given to those parts which act intermittently. Surprising smoothness of operation is the result—which means long life for the machines and sustained accuracy and high production in their products.

Model "B" Acmes are built in bar capacities of 2¼" 3 5/16"

The National Acme Company

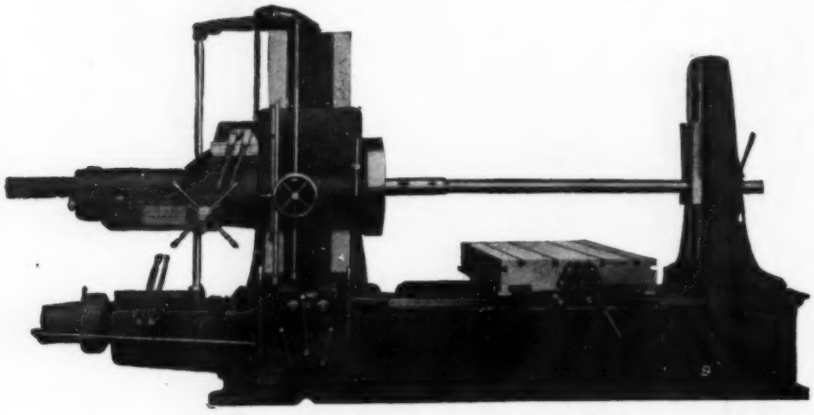
Cleveland, Ohio Windsor, Vt.

New York Detroit Chicago

Makers of Acme and Gridley Multiple Spindle Automatics, Gridley Single Spindle Automatics and Gridley Multiple Spindle Chucking Machines at Windsor, Vermont, and Namco Opening Dies, Collapsing Taps and Screw Machine Products at Cleveland, Ohio

"A man's worth is measured by the degree of supervision he requires"

Similarly, a machine's worth is affected by the amount of checking up required of the operator.



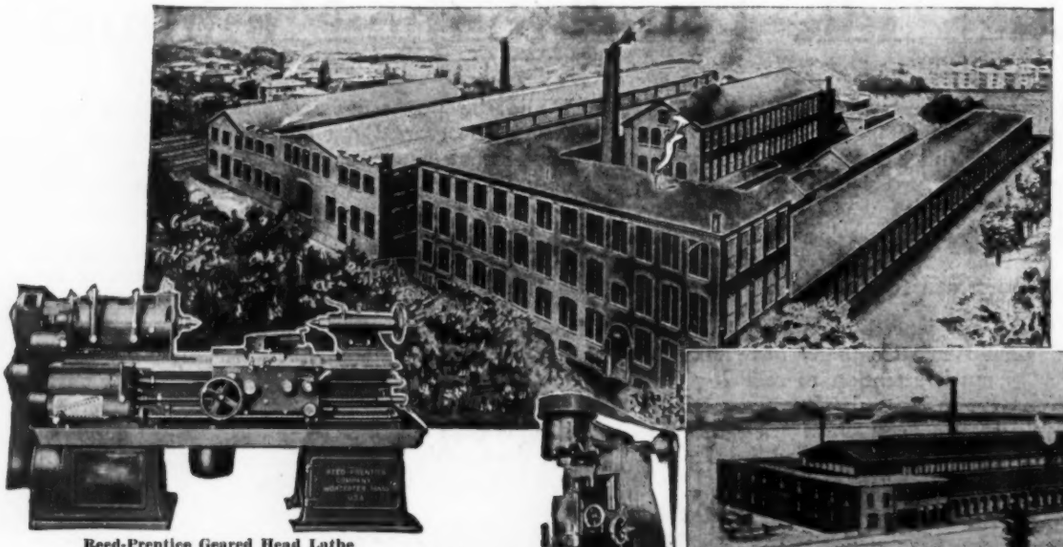
The LUCAS "Precision" Boring, Drilling and Milling Machine is ACCURATE and DEPENDABLE

THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND, OHIO

We also make the LUCAS Power Forcing Press



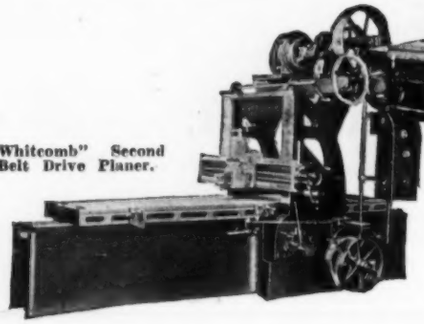
Reed-Prentice Geared Head Lathe

76 Years a builder of "Master Tools" of Industry

Foundry Division

Since 1849, over three-quarters of a century, the companies of which Reed-Prentice is the outgrowth have been designing and constructing machine tool equipment.

REED-PRENTICE Lathes, BECKER Die Sinking and Vertical Milling Machines and WHITCOMB Second Belt Drive Planers are known the world over for their high quality, accuracy and durability.



"Whitcomb" Second Belt Drive Planer.

"Becker" Die Sinker and Vertical Miller.

REED-PRENTICE CORP.

MACHINE TOOLS

WORCESTER MASS. U.S.A.

Branch Offices:

New York, N. Y.: 149 Broadway—537 Singer Bldg. Detroit, Mich.: 3-245 General Motors Bldg.

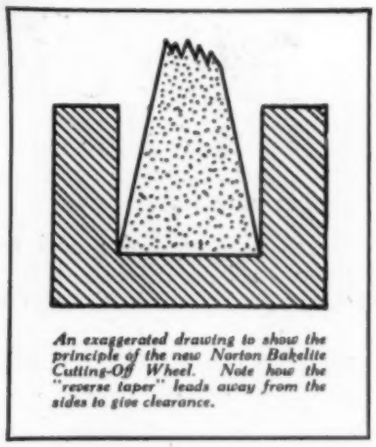
Representatives throughout the World

Lightning Fast

—the Norton Bakelite Bonded Cutting-Off Wheel

With an open, porous structure due to the Bakelite bond and with a special "reverse taper" shape that prevents side grinding or binding, it slips easily and speedily through the hardest materials. It speeds production — reduces costs.

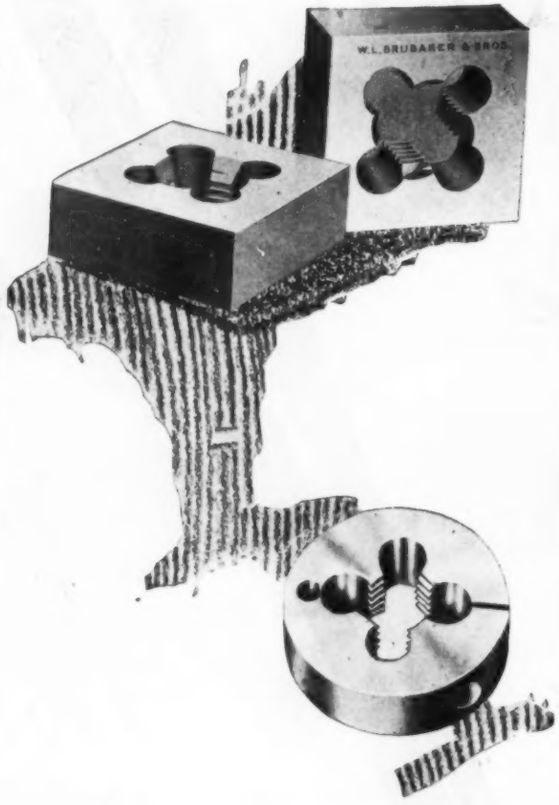
In addition to this open structure wheel there is also a range of dense structure Bakelite cutting-off wheels, shellac bonded wheels and rubber bonded wheels. Thus it is possible to meet efficiently the particular requirements of any cutting-off job.



An exaggerated drawing to show the principle of the new Norton Bakelite Cutting-Off Wheel. Note how the "reverse taper" leads away from the sides to give clearance.

NORTON COMPANY, WORCESTER, MASS.
New York Chicago Detroit Philadelphia Pittsburgh Hartford
Norton Company of Canada, Limited Hamilton, Ontario

NORTON GRINDING WHEELS



Double threading double cost

No one knows better than the assembler what poor threads cost in time and money.

When screws, bolts and studs have to be rethreaded before they "go home" in their respective places, deliveries are held up and costs practically doubled.

Prevent this item of industrial waste by insisting on correct thread cutting dies.

Brubaker Round and Square Dies are correct. Selected materials, proven design and proper heat treatment insure this.

We do not compare them with others, for there are none that equal their performance.

W.L. BRUBAKER & BROS. Co.
FACTORY, MILLERSBURG, PA.
Sales Office: 50 Church St., New York

The lever section of this magneto is economically produced from Union Drawn Steel Bars supplied in the odd shape illustrated. Machining costs for completing the parts are reduced to a minimum

In the production of many finished parts, these special shapes supply the elements of strength, high wearing resistance, clean surface, *and above all*- economy

UNION DRAWN STEEL CO.
Beaver Falls, *Pennsylvania*

UNION DRAWN STEELS

Manufactured by Cincinnati Grinders, Inc., Cincinnati, Ohio

G-E MOTORS are as much a part of this modern grinder as the wheel spindle and headstock which they drive. Thus, its manufacturer provides a powerful, compact, rigid, accurate machine tool that assures speed, efficiency, and economy to the user.

And G-E push-button control with temperature overload relay, conveniently placed for more effective operation, assures "full-time" performance and complete protection to the motor from the variable loads encountered in this form of grinding.

More and more, manufacturers are working with G-E machine tool specialists in putting G-E Motors and G-E Control on their machines. *Specify* G-E Motorized Power and you get a modern electrified machine.

Motorized Power
–fitted to every need

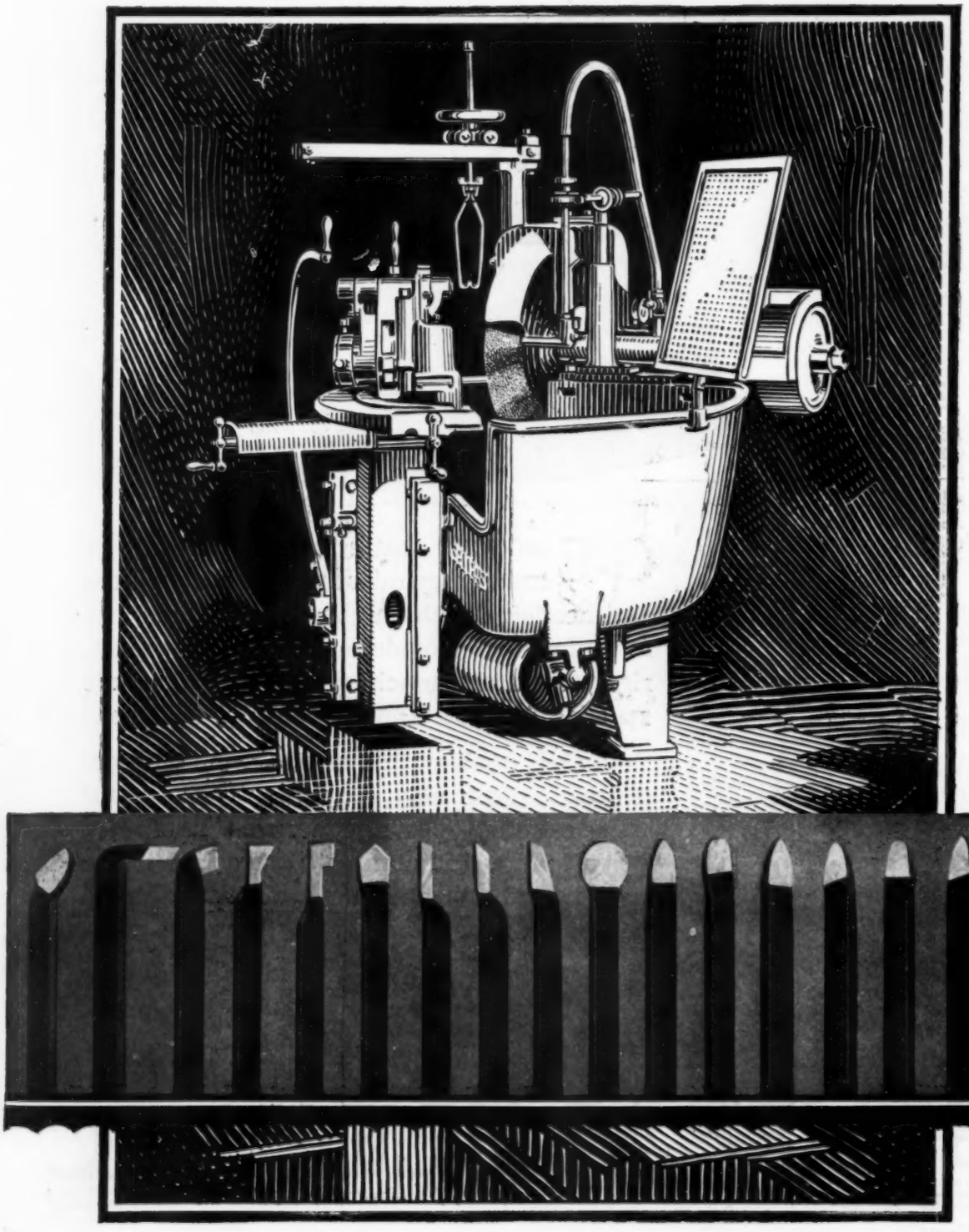
200-67

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY N. Y., SALES OFFICES IN PRINCIPAL CITIES

How

[SELLERS] Tool Grinder



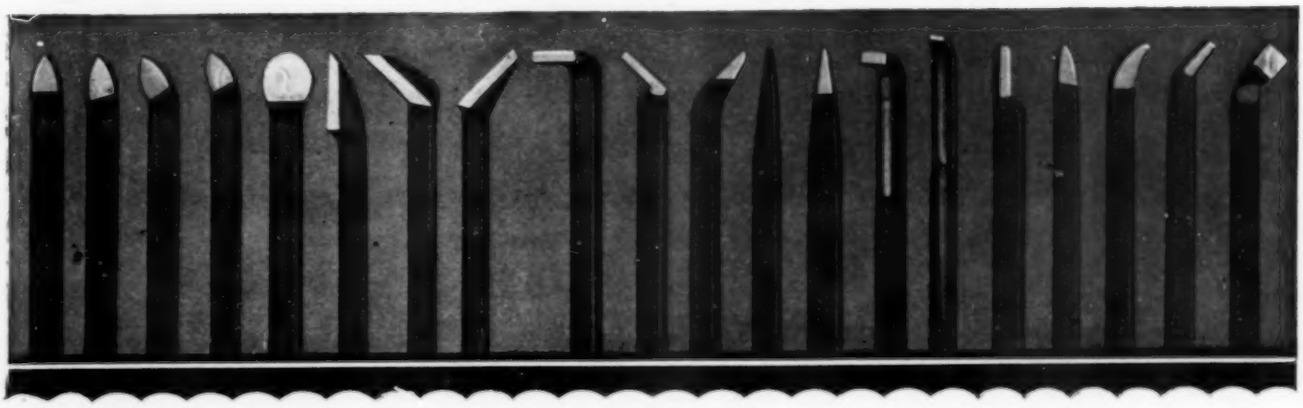
do you grind your tools?

Does each man in your shop grind them according to his own ideas—or do you employ a formula, scientifically worked out to give a proper angle to each tool face? Shops in which the Sellers method has supplanted the old-time practice of hand grinding have made truly remarkable records of savings effected. These savings are not only of tool steel because of less frequent grinding, but in cutting time as well, since a correctly ground tool will remove more metal and maintain a greater cutting speed. The Sellers Tool Grinder is designed to produce correctly ground tools of any desired shape with constant mathematical accuracy. Its record of satisfactory performance dates back to 1886. The action is as simple as it is accurate and any shop hand can operate it.

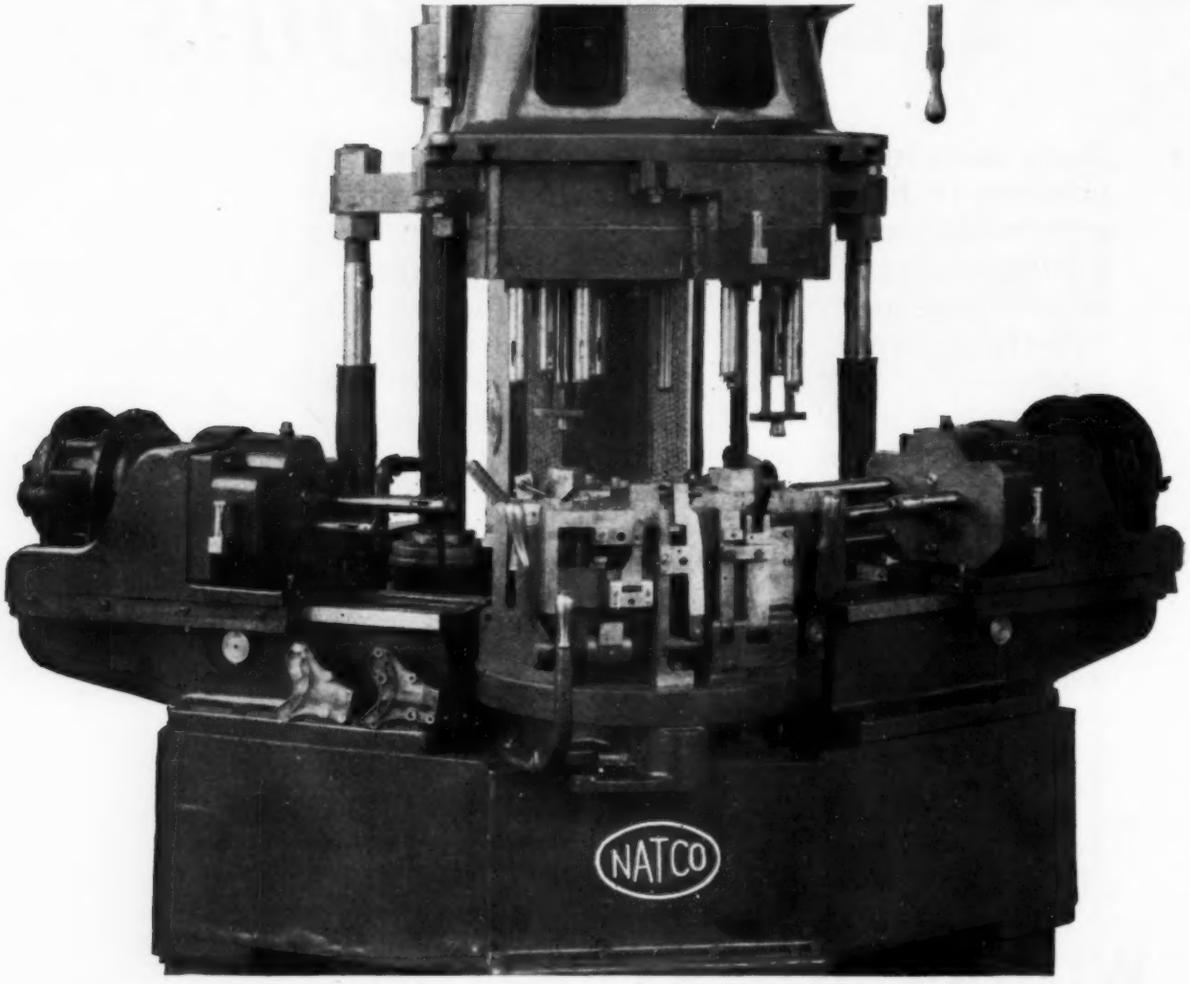
Let us explain in detail what the Sellers Tool Grinder will do for you.

WILLIAM SELLERS & CO. INCORPORATED

Philadelphia, U.S.A.



2400 HOLES IN 120 CASTINGS EVERY HOUR



UNRETOUCHED PHOTO OF

STANDARD C13 HYDRAULIC WITH

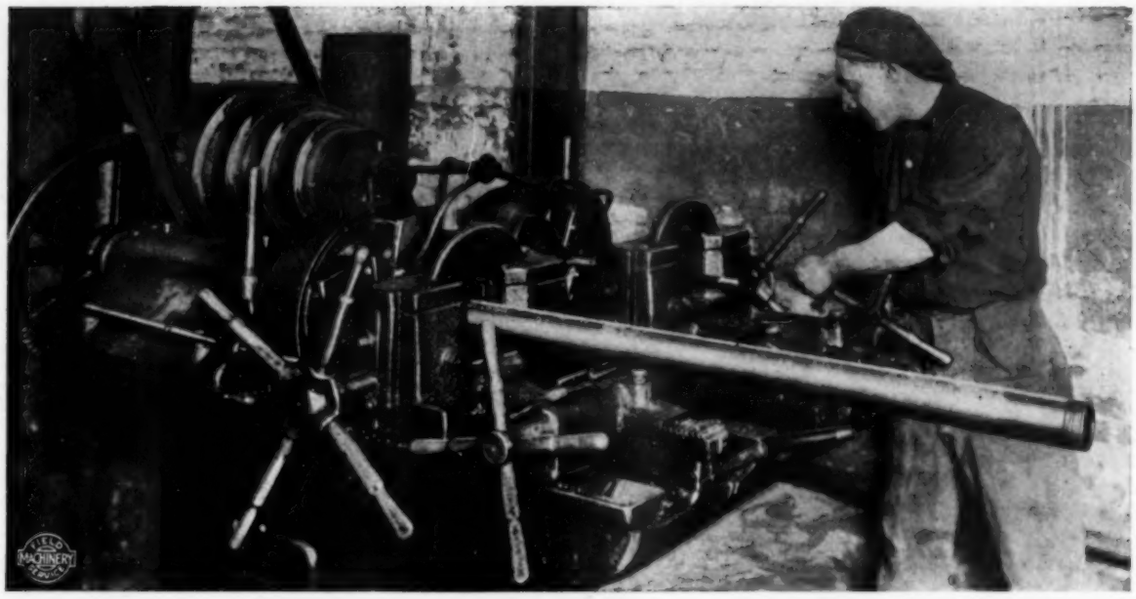
Fixtures, 3 position rotary table, and two special horizontal heads for drilling 19 holes and counterboring 1 hole in a cast iron frame for a phonograph motor. The 19 drilled holes are of 9 diameters which vary in size from .081 to .370, and are drilled from six directions.

A PRODUCTION OF 120 COMPLETE PIECES PER HOUR IS BEING MAINTAINED

You may not manufacture phonograph parts but you may be drilling holes on which the method can be improved.
We are "hole" specialists. Mail us your part prints for a proposition.

THE NATIONAL AUTOMATIC TOOL CO.

RICHMOND, INDIANA, U. S. A.



A Fifteen Year Old "LANDIS"

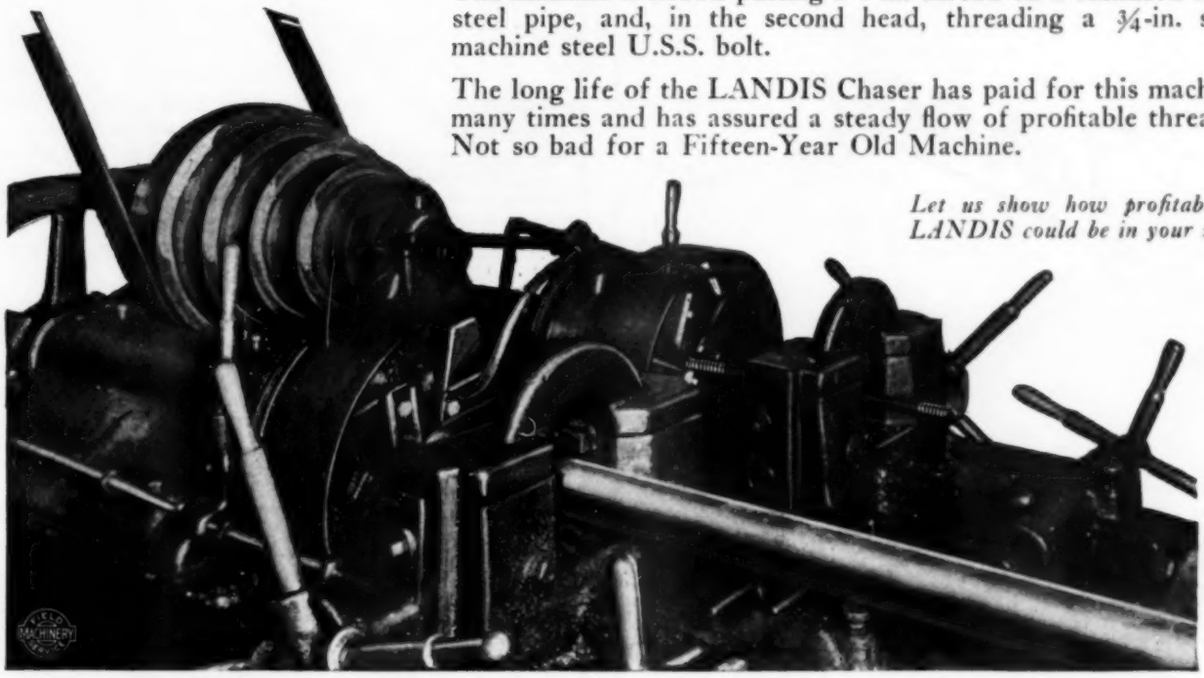
LANDIS TRADE — MARK

Fifteen years ago the Camden Heating Company, Camden, N. J., installed a LANDIS Double Head Bolt Threading Machine for threading 2-in., 1½-in., 1¼-in. and ¾-in. steel pipe and U.S.S. bolts, ½ in. to 1½ in. Through all these years this LANDIS Machine has given fast, accurate, reliable production 8½ hours per day, 5 days per week.

The machine is shown putting a 1-in. thread on a standard 2-in. steel pipe, and, in the second head, threading a ¾-in. soft machine steel U.S.S. bolt.

The long life of the LANDIS Chaser has paid for this machine many times and has assured a steady flow of profitable threads. Not so bad for a Fifteen-Year Old Machine.

Let us show how profitable a LANDIS could be in your shop



LANDIS MACHINE COMPANY, Inc., Waynesboro, Pa.

Detroit Office: 5928 Second Blvd.

DOMESTIC AGENTS: Marshall & Huschart Machinery Co., Chicago, Ill.; Marshall & Huschart Machinery Co., of Indiana, Indianapolis, Ind.; Colcord-Wright Machinery & Supply Co., St. Louis, Mo.; R. B. Whitacre & Co.; St. Paul, Minn.; Hamilton Machinery Co., Chattanooga, Tenn.; Young & Vann Supply Co., Birmingham, Ala.; Woodward, Wight & Co., New Orleans, La., Shreveport, La., Tampa, Fla.; Jos. T. Ryerson & Son, Houston, Texas; Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.; Salt Lake Hardware Co., Salt Lake City, Utah; Harry M. Euler Co., Portland, Ore.; Hallidie Machy. Co., Seattle, Wash.; Hallidie Co., Spokane, Wash.; Herberts Machinery & Supply Co., San Francisco, Calif., and Los Angeles, Calif. R. S. Armstrong & Bro. Co., Atlanta, Ga.

CANADIAN AGENTS: Canadian Fairbanks-Morse Co., Toronto and Montreal.

FOREIGN REPRESENTATIVES: Benson Brothers, Ltd., Sydney; Schuchardt & Schutte, Berlin, Vienna, Prague, Warsaw; R. S. Stokvis & Zonen, Rotterdam, Brussels, Soerabaya; M. Almeida & Cia. Sao Paulo, Rio de Janeiro; Alfred Herbert, Ltd., Coventry, Calcutta, Osaka; Burton Fils, Paris; D. Drury & Company, Johannesburg.

Now-more than ever-manufacturers need the lower cost production of the

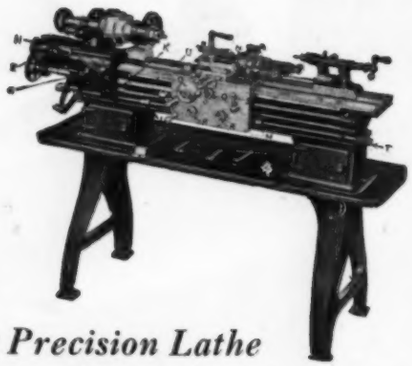
New Britain

Super-Production CHUCKING MACHINES

The New Britain Machine Co.
New Britain, Conn.

NEW BRITAIN NB AUTOMATICS

Cataract Precision Lathes & Millers

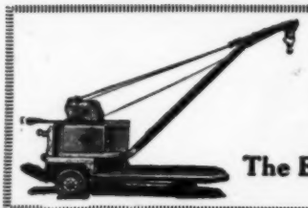


Quick Change Swing Precision Lathe

This Lathe has firm and well-ribbed bed of liberal design, simple, and rigid headstock capable of developing enormous pulling power. The wide range of speed makes this lathe ideal for general tool room use.

Write for Cataract Bulletin.

HARDINGE BROTHERS, Inc.
4149 Ravenswood Ave., CHICAGO, ILLINOIS



Electric Industrial Crane Truck
One of 25 Types Each Built for Special Lift and Carry Service
Request Catalog 811
The Elwell-Parker Electric Co.
Cleveland, Ohio

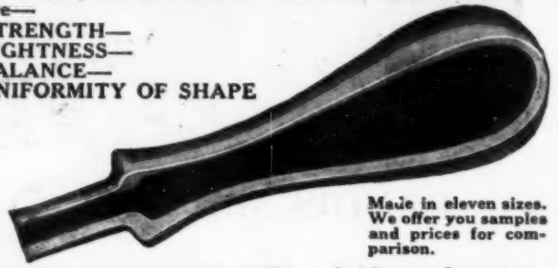
DICKINSON DIAMOND TOOLS

for truing Large, Coarse and Hard Grinding Wheels, give the greatest amount of service with a minimum of wear on the diamond. The name "Dickinson" is stamped on all tools. We are proud of a long record of satisfactory service.

THOS. L. DICKINSON, 38 Gold Street, New York City
Successor to John Dickinson — Established 1796

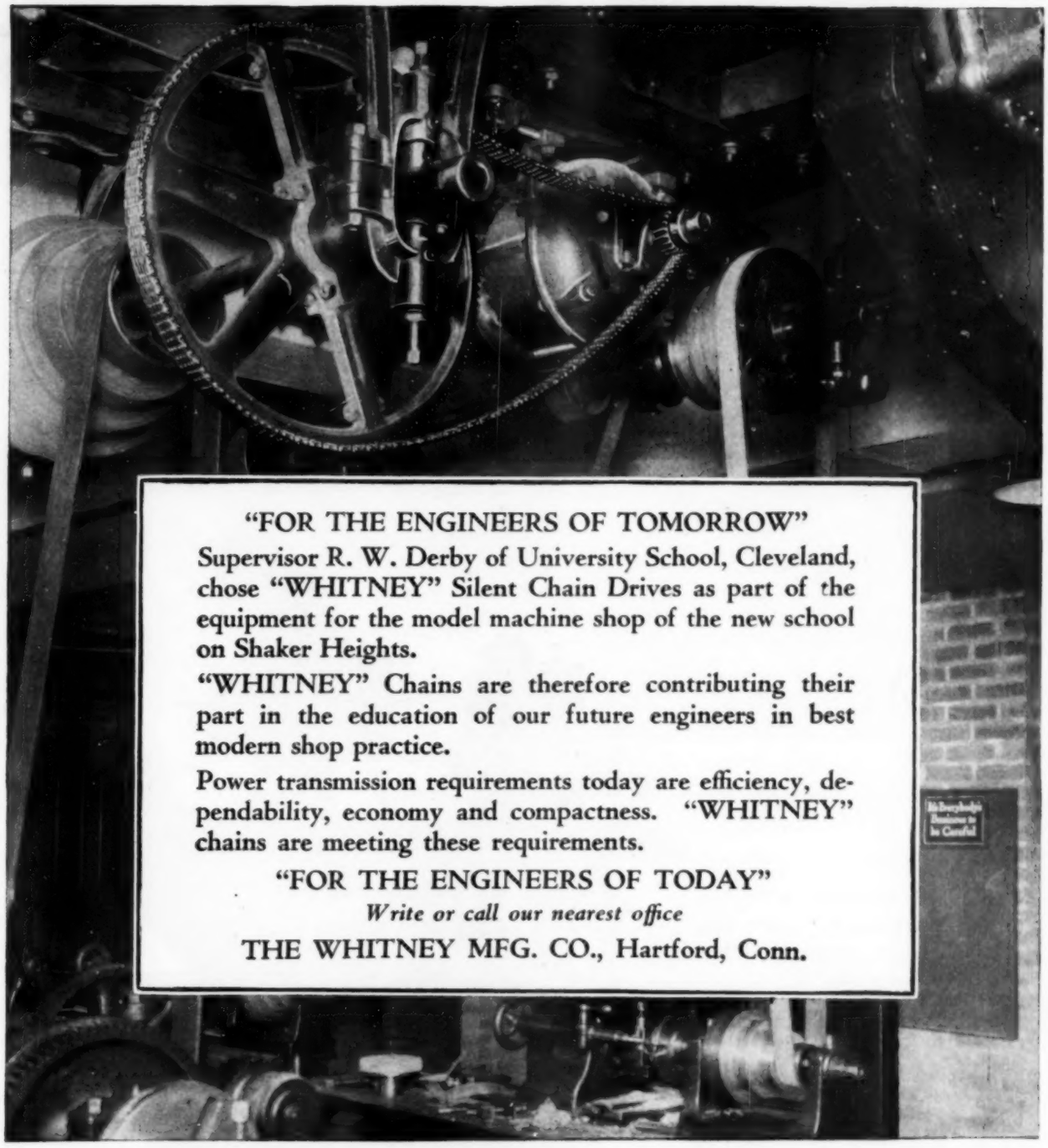
COMBINED FEATURES

found only in Rockwood Pressed Steel Machine Handles are—
STRENGTH—
LIGHTNESS—
BALANCE—
UNIFORMITY OF SHAPE



Made in eleven sizes. We offer you samples and prices for comparison.

Rockwood Sprinkler Co. of Massachusetts
General Manufacturers of Pressed Steel Products — Worcester, Mass.
London Office: 147 Queen Victoria St., E. C. 4



"FOR THE ENGINEERS OF TOMORROW"

Supervisor R. W. Derby of University School, Cleveland, chose "WHITNEY" Silent Chain Drives as part of the equipment for the model machine shop of the new school on Shaker Heights.

"WHITNEY" Chains are therefore contributing their part in the education of our future engineers in best modern shop practice.

Power transmission requirements today are efficiency, dependability, economy and compactness. "WHITNEY" chains are meeting these requirements.

"FOR THE ENGINEERS OF TODAY"

Write or call our nearest office

THE WHITNEY MFG. CO., Hartford, Conn.

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L. C. Biglow & Co., Inc.
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The Whitney Mfg. Co.
711 Boylston St.

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George McPherson
201 Norwood Ave.

CHICAGO
The Whitney Mfg. Co.
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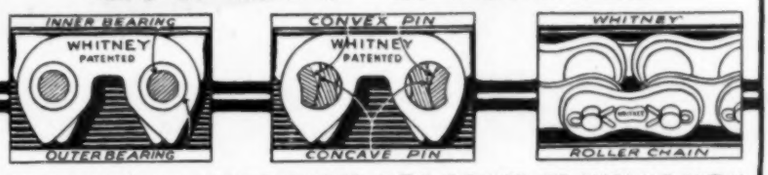
"WHITNEY"
CHAIN DRIVES



CHAINS AND SPROCKETS FOR POWER TRANSMISSION

SALES AND ENGINEERING OFFICES:

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Pittsburgh Gear & Mach. Co.
27th & Smallman Sts.

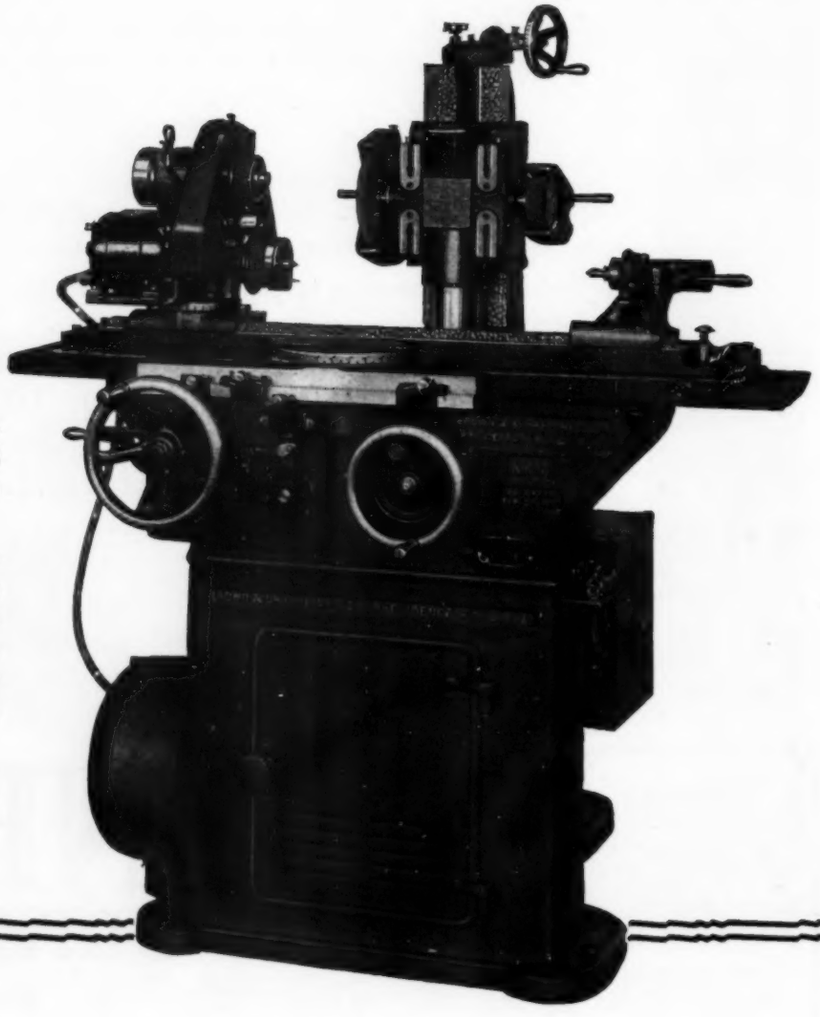
CLEVELAND
Smith Power Transmission Co.
1218 Ontario St.

DETROIT
The Whitney Mfg. Co.
2-240 General Motors Bldg.

SAN FRANCISCO
A. H. Coates Co.
615 Howard St.

SEATTLE
A. H. Coates Co.
1743 First Ave. So.

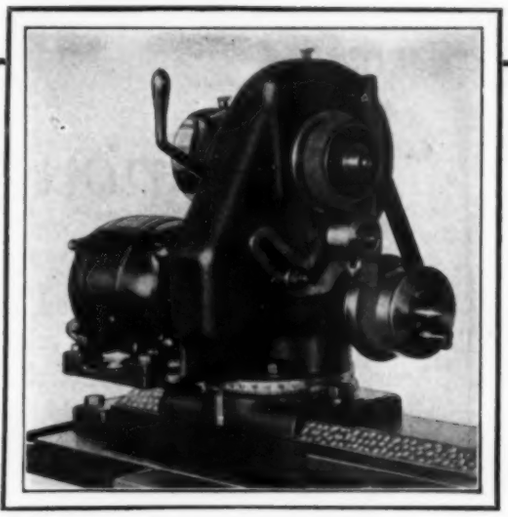
Another popular type of
Brown & Sharpe Grinding Machine
now available with individual motor drive—
the No. 13
Universal and Tool Grinding Machine

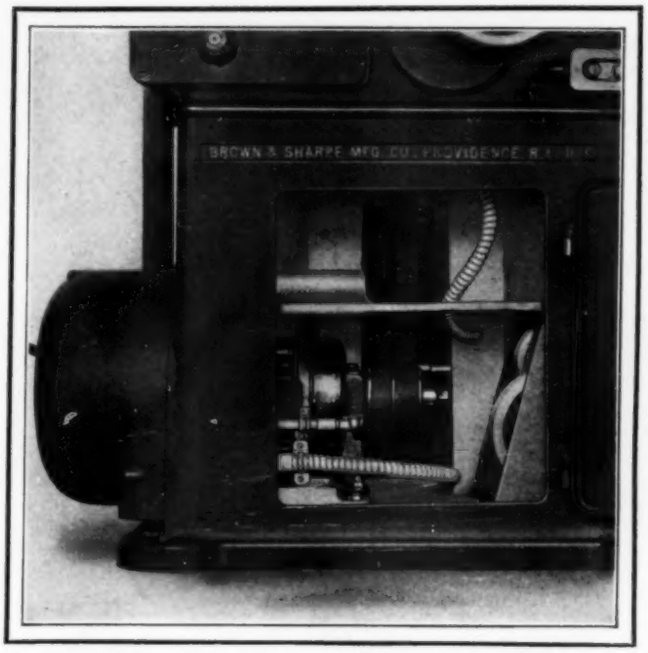


Two motors are used on the No. 13 Universal and Tool Grinding Machine when equipped with a self-contained motor drive.

The main driving motor is installed in the base and drives the table feeds and the wheel spindle. A second motor is mounted in a recess at the rear of the headstock to drive this unit.

Both motors are controlled by a push button switch on the front of the machine.





THE motor compartment in the base is large and well ventilated and insures complete protection for the motor. Ample space permits of the installation of a generator to furnish direct current when a magnetic chuck is used. The generator is driven direct from the main motor. There is also ample storage room in the compartment for the change pulleys and other accessories.

The headstock is a compact, detachable unit, built sturdily and with sufficient weight to eliminate vibration. The speed changes are made with change pulleys and the work can be held by either live or dead centers. A convenient lever operates a quick acting clutch which starts and stops the rotation of the work without stopping the driving motor.

We shall be glad to send specifications of the machine or to have our representative tell you about it.

Brown & Sharpe Products

Milling Machines
Grinding Machines
Gear Cutting Machines
Screw Machines
Cutters and Hobs
Machinist's Tools
Gears Cut to Order

BROWN & SHARPE

BROWN & SHARPE MFG. CO. PROVIDENCE, R. I., U. S. A.

"Fair Enough"— The Super

"Kennedy, I see a point in this ad, on a drill that does 2,400 holes in 120 castings every hour. Down at the bottom of this ad it says that we may be drilling holes on which our methods can be improved. It says further that this drill manufacturer is a 'nole' specialist and suggests that we send in some part prints for a proposition.

"What do you say to our picking a print or so from your engineering design files and sending them on just to see how far this 'hole' specialist idea can go for us?"

"That's a good plan, Hawkins, I can think of several jobs that my designers have had to 'engineer' into the machines at our disposal even though they have not been adapted to the work required. I've let them do this principally because I did not see what could be gained by recommending any particular new equipment. If these chaps can show us tangible savings we will have learned something.

"I say let them show us. We gain very little, in fact we lose, from my stand on design as well as yours on production, when we stay too much at home and do not keep in touch with the goings-on outside."

"We certainly do just that, Kennedy, and I think we should take more action on the offers made us in these advertisements even though the possibilities for us are not at once apparent. You'll never find out until you ask.

"Here's another ad that touches on your side, Kennedy— this one on steel that talks about steel abuse on the part of the user. There's a point I don't understand and want to ask you about.

"This ad says that one abuse is the apparent lack of serious attention to see that liberal fillets are always provided at changes in section. Just how important is that?"

"We have watched that point carefully in our own designs, Hawkins. Wherever there is an inside turn or a shoulder it is very important that there be no sharp corners. Such a corner is very liable to start a crack in the heat treating or when the part is subjected to shock.

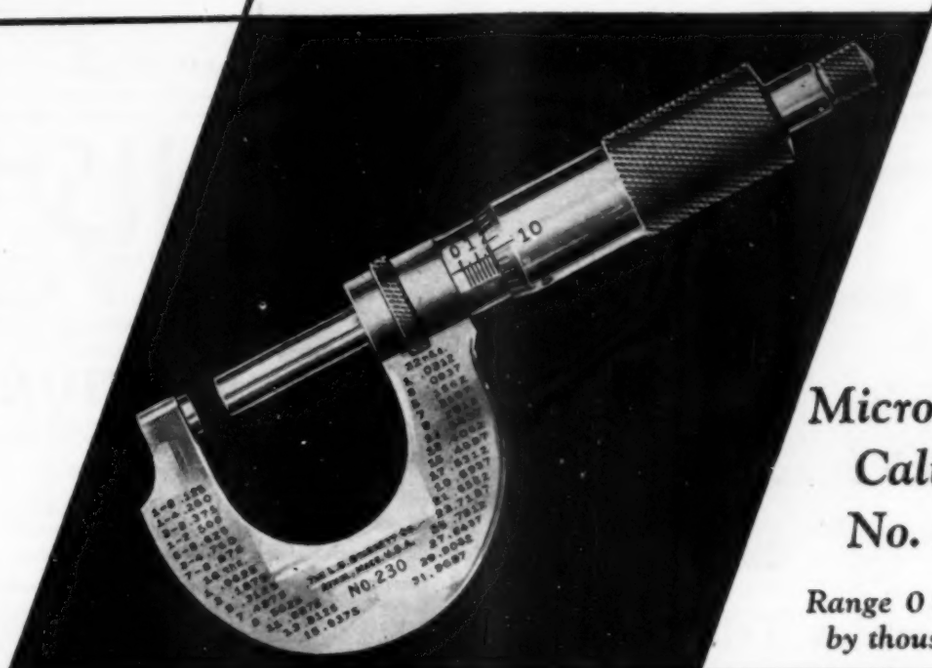
"As a matter of fact, my designers get most of their pointers on such things, as you know, from your department foremen, on our plan of submitting our designs to them for criticism."

"Yes, that plan is working well, Kennedy, we have an excellent plan of co-operation within our shop between engineering and production. What I'd like now is the same close touch with these advertisers. They are anxious to help or they would not advertise. Let's meet them half way."

"And if I find, through these contacts, the possibility of saving that involves the purchase of new machinery or materials, what then, Hawkins?"

"Then, you make up your proposals and specify what you feel we should do and I'll talk turkey with you. Fair enough, Kennedy?"

"Fair enough, Hawkins."



Micrometer Caliper No. 230

Range 0 to 1 inch by thousandths

Where accuracy is part of the day's work you will find

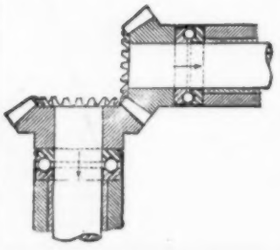
Write for complete Catalog No. 23 "C."

THE L. S. STARRETT CO.
World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy
ATHOL, MASS., U S A

Starrett Tools

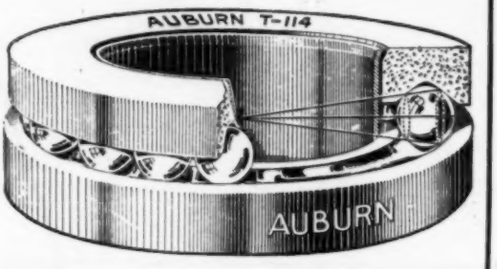
978

AUTOMOTIVE SHOP EFFICIENCY improved with AUBURN THRUSTS

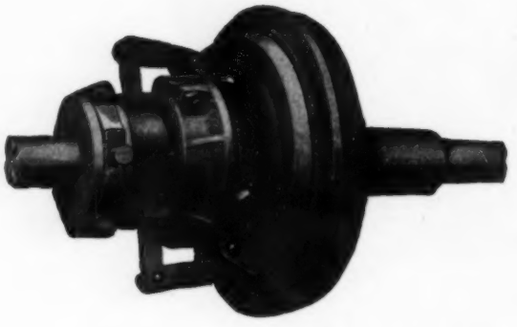


For that "Steady Drive of the Busy Shop" where production schedules must be maintained, Auburn Ball Thrusts are the Bearings to use for Bevel Gears, Worm Drives, Helical Gears, and all those rotating parts subject to End Thrust. Send us details of your problems and get the Auburn Answer.

Steel, Brass and Bronze Balls



AUBURN BALL BEARING CO. Trade Mark Established 1893 **25 Elizabeth St., Rochester, N. Y.**



The "Lemley" Friction Clutch

Send for Catalog No. 30

W. A. Jones Foundry & Machine Company
4404 West Roosevelt Road, Chicago, Ill.

Branch Sales and Engineering Offices:
New York Pittsburgh Milwaukee Cleveland Buffalo Detroit
Birmingham St. Louis Cincinnati

Jones

Power Transmitting Machinery

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ABBOTT BALL COMPANY
"Originators of Commercial Ball Burnishing"
1047 New Britain Ave., Hartford, Conn.

equipment, complete from balls, cones, pins and slugs to the latest type barrels. Send sample parts for a burnishing estimate, no obligation.

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BUSHING BEARINGS

300 Sizes—Always in Stock.

THE BUNTING BRASS & BRONZE CO.
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BCA THRUST BALL BEARINGS
For Machines of All Types

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THE MOST COMPLETE LINE OF BALL TYPES AND SIZES IN AMERICA BEARINGS

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THE FAFNIR BEARING CO. NEW BRITAIN, CONN.

MOORE & WHITE

FRICTION CLUTCHES

Since 1885
Time tested and approved.
More in demand than ever.

YEAR	IN USE
1885	2,500
1900	75,000
1915	150,000
1927	250,000

250,000 Moore & White Friction Clutches in use today—*there's a reason.*

Need a Clutch? Send for our free Catalog, today. Ask for Catalog E

THE MOORE & WHITE CO.
2701 No. 15th St., Philadelphia, Pa.

BROWN'S
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Have working parts wholly enclosed.
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Cast Iron of all sizes
and every description
THE A. & F. BROWN CO.
ELIZABETHPORT, N. J.

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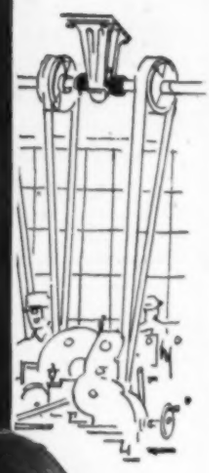

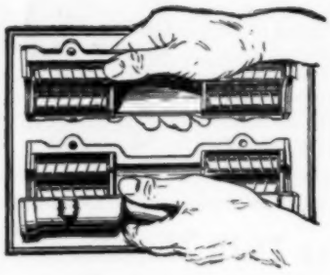

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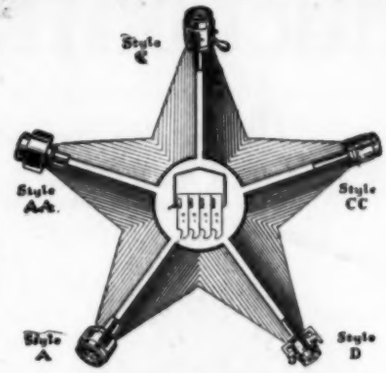

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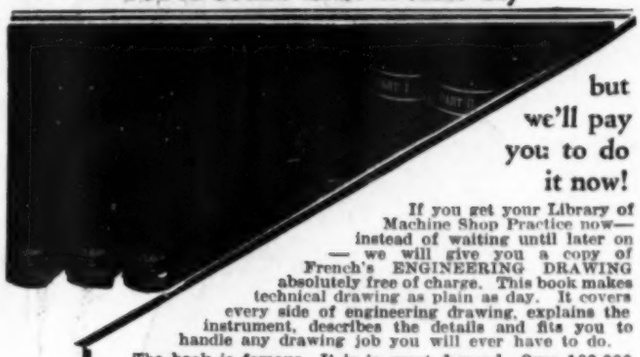

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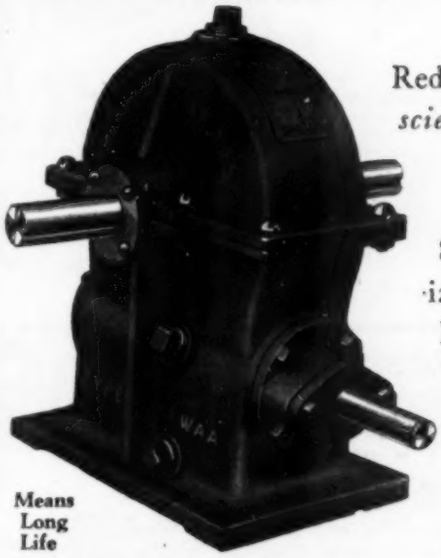

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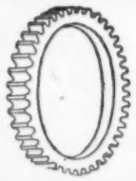

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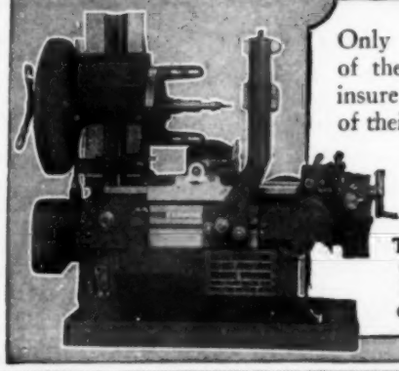

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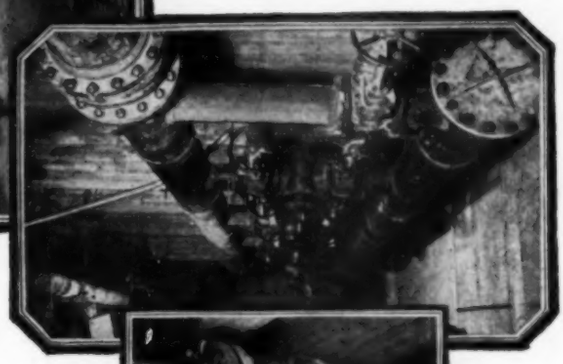

Left: Operator at work on one of the 16-inch steam risers. *Center:* Main riser with five manifolds, showing 8-inch welded connections. *Below:* 16-inch flange, welded on both sides of expansion joint.

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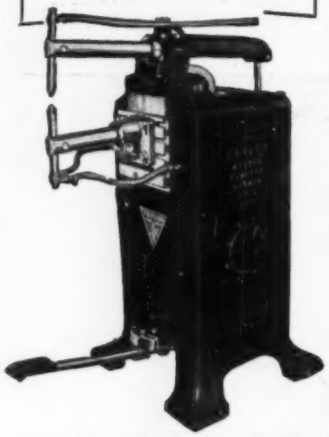

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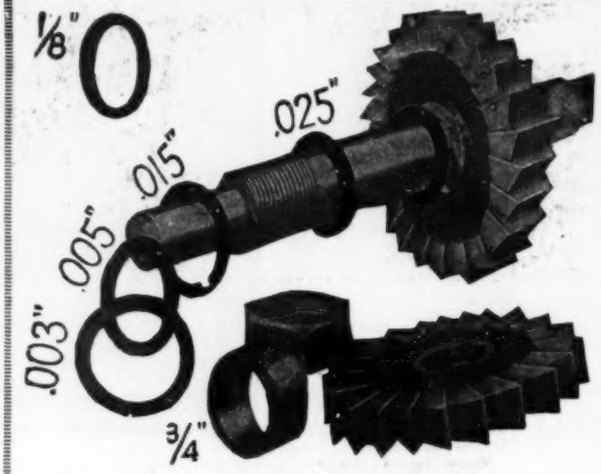

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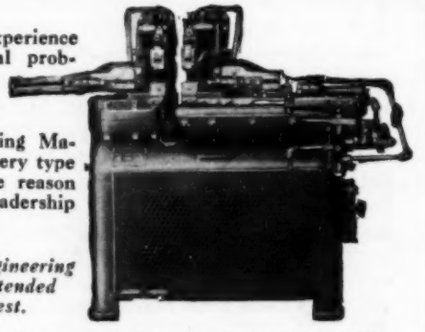
OUR wide experience in the practical problems of welding, plus the widest variety of Stock Welding Machines to fit every type of work, is the reason for Thomson leadership in this field.



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361 Pleasant St., Lynn, Mass.

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Has Never Been Questioned

Complete line of electric spot, butt and seam welders, standard or special

The Federal Machine and Welder Co., Warren, Ohio

Recognized leaders in the development and production of resistance welding machines.

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Hand and Automatic

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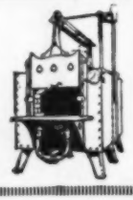

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Industrial Furnaces and Furnace Room Accessories

The Strong Carlisle & Hammond Co.
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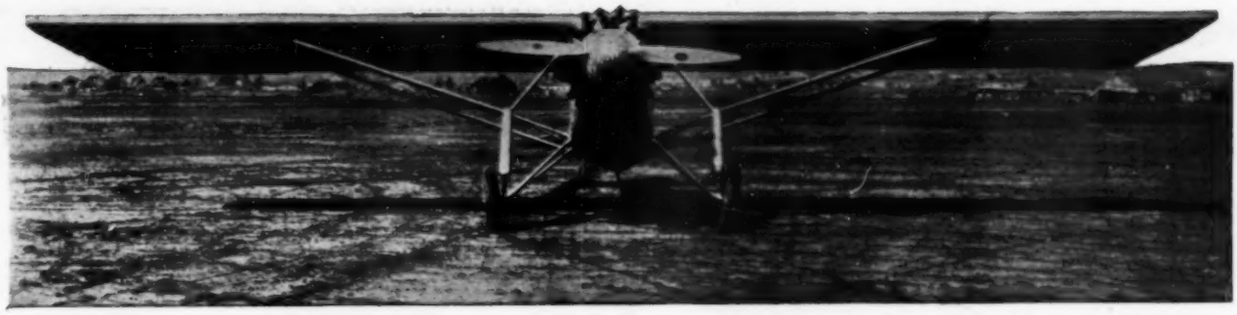


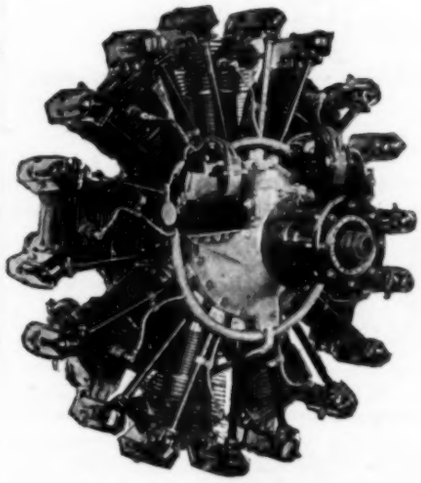
You will recall that WRIGHT WHIRLWIND engines carried both Captain Lindbergh and Pilot Chamberlin safely to Europe in non-stop flights from New York.

It will be interesting to you to know that all of the furnaces and ovens used for heat treating and processing various parts of our WRIGHT WHIRLWIND engines were made by the American Gas Furnace Company. We are proud to share with them the credit for the high quality maintained in the WRIGHT WHIRLWIND engine.

Very truly yours,

WRIGHT AERONAUTICAL CORPORATION

J. T. Harrison



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AMERICAN GAS FURNACE CO.

Main Office and Works: Elizabeth, N. J.

We Make

Automatic Heat Controllers
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Blowpipes or Blowtorches, Hand and Stand
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Brass Melters
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Forges
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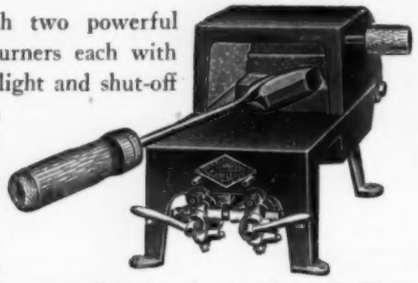
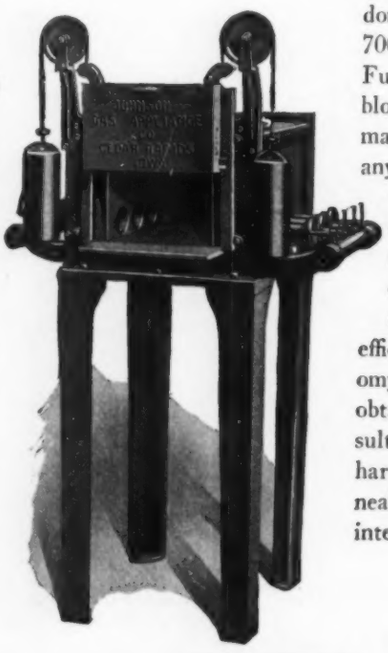
Every Type of Gas Blast Burner, Furnace and Heating Machine for Industrial Uses.

1600 to 1800 Degrees F.
without forced air blast!
Johnson No. 101 Bench Furnace



Equipped with two powerful atmospheric burners each with separate pilot light and shut-off valve, this furnace will produce a heat of 1600 to 1800 degrees F. in the fire-box. And this is accomplished without a blower! This is one of the most efficient and economical bench furnaces on the market. Write for details.

As High As 2150 Degrees F.
without forced air blast!



That's what may be done with the No. 700 Johnson Oven Furnace without a blower. The heat may be regulated to any exact temperature up to 2150 degrees F. There is not a furnace on the market surpassing it in efficiency and economy. Now you may obtain perfect results in carbonizing, hardening, and annealing. Write for interesting details.

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The Johnson No. 8 Adjustable Torch and Melting Pot is used extensively by metal workers, plumbers, and machinists. The burner may be removed from the stand and used as a hand torch. The pot and shield may be removed instantly and the torch adjusted to any angle for soldering, tempering, or pre-heating work. The melting pot has a capacity of 25 pounds and may be used for melting any soft metal.

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Where saving of head-room is an important factor, use the "Peerless" Trolley Hoist. It is very compactly constructed, thereby assuring a minimum space between hook and beam. Furthermore, the Roller Bearings on the trolley wheels assure easy movement along level beam.

Harrington makes hand chain hoists in six types, with capacities from ¼ to 20 tons,—also a standardized electric hoist for 1 ton loads.

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In stock and to order.
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Capacities 1000 to 24,000 lbs.
5 Types
For A.C. or D.C.

"The Electric Hoist that operates in the Minimum Headroom"
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RHOADS
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J. E. RHOADS & SONS
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SPRINGFIELD, MASS.

"I've never broken one yet!"

Price of accomplishment shows itself in many ways. This workman, when asked if the parts of Ford Tribloc Chain Hoists withstood the hammering and driving incident to renewing load chains, remarked "I've never broken one yet!" With that he brought his 2-pound hammer down on the internal gear with all the strength in his sinewy arm. But nothing happened, except that the hammer made a slight dent in the surface.

Ford Tribloc Chain Hoists are made to such high standards in every detail—from the selection of the metal to the final tests of the finished hoists—that thousands of Triblocs have been bought for the use of each of many large corporations.

And because these large purchases are based on something besides mere opinion, you may be sure that such hoists as these are sure to give gratifying results in your shop. *Send for Catalog 7-B.*

FORD CHAIN BLOCK COMPANY
Second and Diamond Sts., Philadelphia, Pa.

Cost more to make.

Costs less to use.

TRIBLOC
CHAIN HOIST

We also manufacture "THE MOTORBLOC"—an electrically driven chain hoist.

for all types of industrial machinery

The applications of Raybestos run the gamut of Industrial machinery. It serves as a frictional slip clutch on fractional horsepower motors and effectively brakes 50-ton cranes. The essence of more than 20 years' experience is at the call of any manufacturer. Ask us to recommend the right size and type. Catalog upon request.

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Eliminate the Fire Hazard

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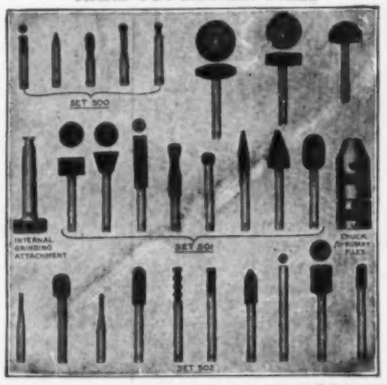
HAND CUT ROTARY FILES



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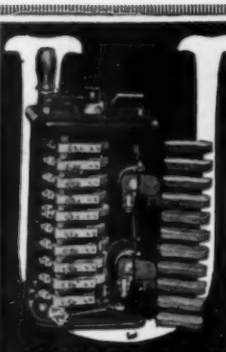

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All General-Purpose Motor Control applications.

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"The Best I Have Ever Seen"

Recently a steel mill superintendent wrote us about Tirex:

"This cord has been tried under the most adverse conditions, such as coming in contact with steel, extreme heat, wire, lime and water and it has proven to stand up wonderfully well. I wish to recommend it to anyone who has use for a portable cord along this line as being the best I have ever seen."

Let us prove it to you also. A try will convince you. Send for sample piece.

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Manufacturers
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CLARK AUTOMATIC DRILL

Switch "Handy to the Hand." Full line of electrically driven drills and grinders.

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OHIO *reliable* MOTORS
1/20 to 1/3 H.P.
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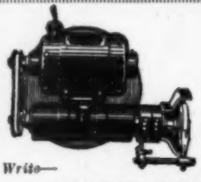

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Are dynamically balanced and vibrationless
Light and portable, easily carried to any job or setup.
Operate equally well on AC or DC.
Designed for internal or external precision grinding.
Six styles and sizes provide a grinder for every need.

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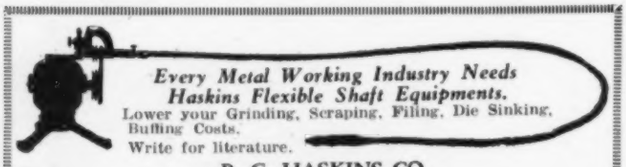
OPEN-SIDE
PLANERS
THE CLEVELAND PLANER COMPANY, CLEVELAND, OHIO



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Lower your Grinding, Scraping, Filing, Die Sinking, Buffing Costs.
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DRILLS
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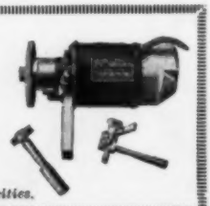

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Screw Plates, Taps, Dies, Reamers, Gages, Pipe Tools, Twist Drills, Milling Cutters, also Plain, Internal and Universal Grinders, etc.

Look for our full page advertisement the first and third issues of each month.

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GTD

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LINDBERGH *adds*

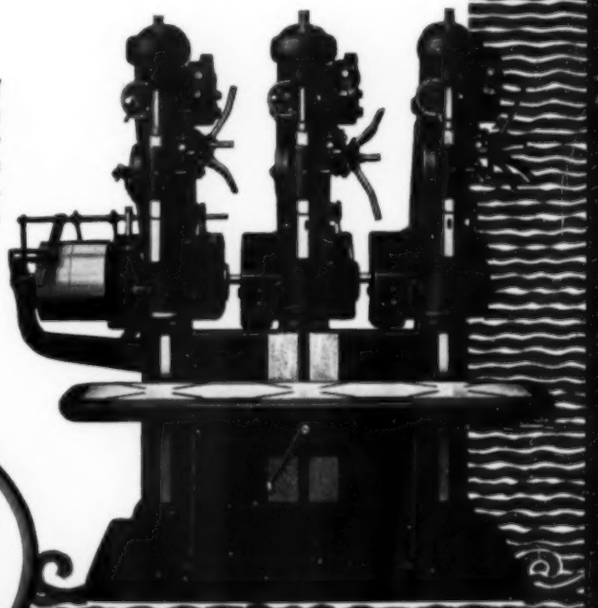
New LAURELS to Our 20th Anniversary Celebration

SPECIALIZING in the design and manufacture of Production All Geared Drilling and Tapping Machines, brings the Barnes Drill Co. on its ***20th anniversary*** to undisputed leadership in this particular line of endeavor.

For twenty years Barnes Drill Co. engineers have been profiting by the lessons their experience has taught them—governing each step of development in their Self-Oiling All Geared Drilling and Tapping Machines by practical results in the field. These are the real factors that stand back of the supremacy of Barnes Drill Co. products.

A policy of concentration, specialization and singleness of purpose through all these years brings us to our ***20th anniversary*** with new laurels added by the achievement of Colonel Charles A. Lindbergh.

The engine used by Lindbergh in his astonishing flight from New York to Paris, has proven this engine one of the most reliable, most durable, efficient and economical aviation engines in the world. Barnes Drill Co. All Geared Drills, through their accuracy and efficiency, are given credit by the Wright "Whirlwind" engine builders, for helping in no small way to contribute to this aviation achievement. This news, coming as it does at this time, makes our ***20th anniversary*** one to be long remembered and spurs us on to greater effort and accomplishment in the future.



Self Oiling All Geared 20-Inch Three Spindle Gang Drill. This can also be furnished in 24-Inch size.

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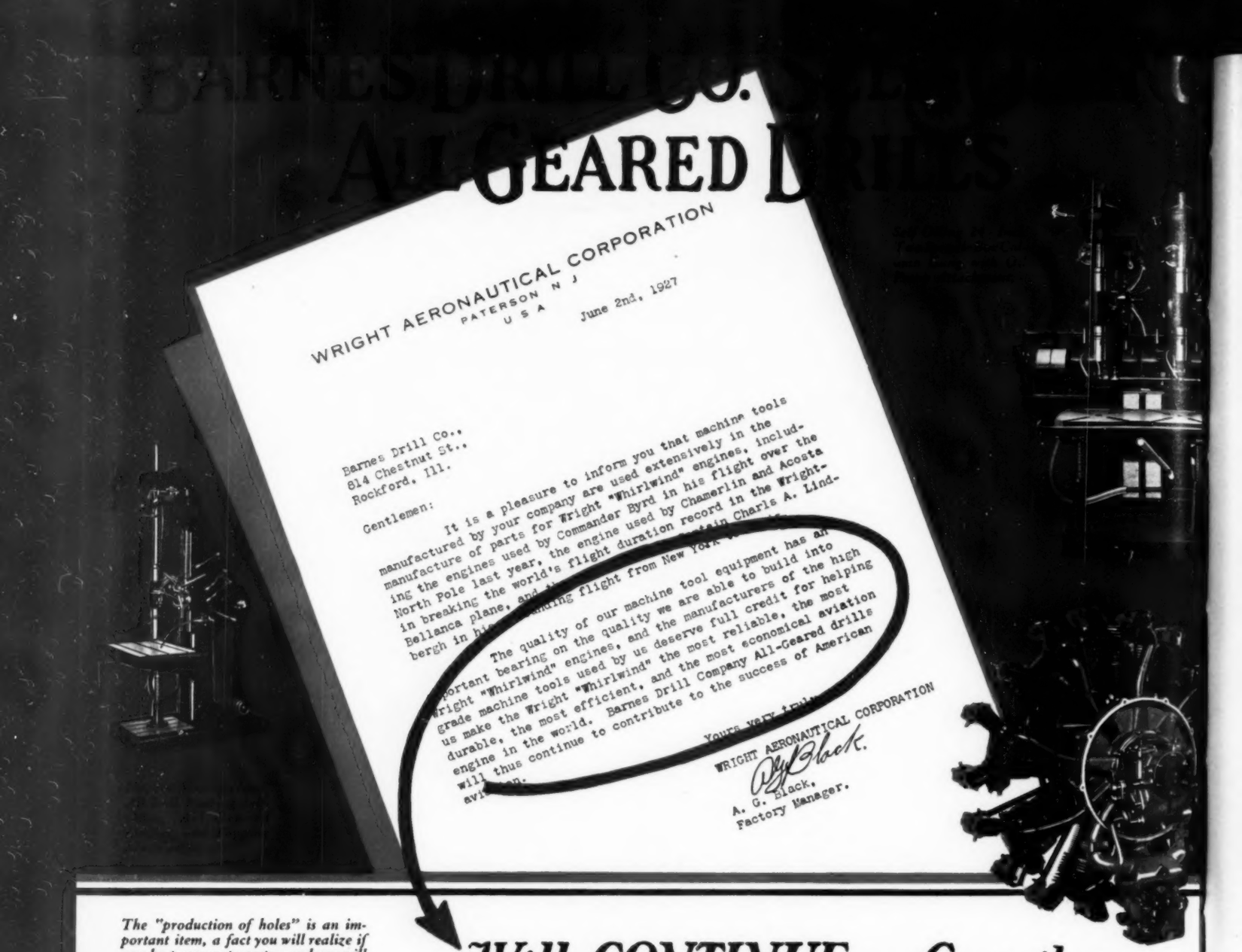
GEARED
WRIGHT AERONAUTICAL CORPORATION
PATERSON N J
U S A
June 2nd, 1927
Barnes Drill Co.,
814 Chestnut St.,
Rockford, Ill.
Gentlemen:
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The quality of our machine tool equipment has an important bearing on the quality we are able to build into Wright "Whirlwind" engines, and the manufacturers of the high grade machine tools used by us deserve full credit for helping us make the Wright "Whirlwind" the most reliable, the most durable, the most efficient, and the most economical aviation engine in the world. Barnes Drill Company All-Geared drills will thus continue to contribute to the success of American
WRIGHT AERONAUTICAL CORPORATION
A. G. Black,
Factory Manager.

The "production of holes" is an important item, a fact you will realize if you keep accurate costs—and you will be surprised to learn how much you can save by replacing obsolete drilling machines in your plant. The catalogue tells you why.

Will CONTINUE to Contribute to the SUCCESS of American Aviation

LINDBERGH'S life depended upon a Ryan Monoplane, ***a Wright "Whirlwind" Engine*** and a set of Pioneer instruments. This engine proved itself worthy of such a master as Lindbergh and served him faithfully in his time of need. ***Barnes Drill Co. All Geared Drills*** contributed to the efficiency of this Mechanical Master-piece. Its manufacture demanded the use of ***high grade machine tools.*** The Wright Aeronautical Corporation tells us that the Barnes Drill Co. contributed their share toward this successful and astonishing air achievement. These ***All Geared Drilling and Tapping machines*** are made with the same precision and care that enters into the construction of Wright "Whirlwind" Aviation Engines—they stand supreme in their field. They have unqualified endorsement of thousands of users throughout the world. Let the experience of users guide you to better Drilling and Tapping equipment.

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No. 2 Key-Seating Machine

Users of Knowles Keyseating and Broaching Machines are constantly making new high records for speed of production and consequent low production costs. The Knowles cuts a complete keyway in 10 to 20 seconds with one pass of the cutter. Get the facts and details of this machine.

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SPLINE MILLERS

for closed end keyways and through slots.

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with circular, contour, spiral and continuous milling attachments.

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1 to 7 spindles, hand, power and simultaneous feed. Heads, adjustable for variable distances between spindles.

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Uniform blow, foot or power.

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The TAYLOR & FENN COMPANY
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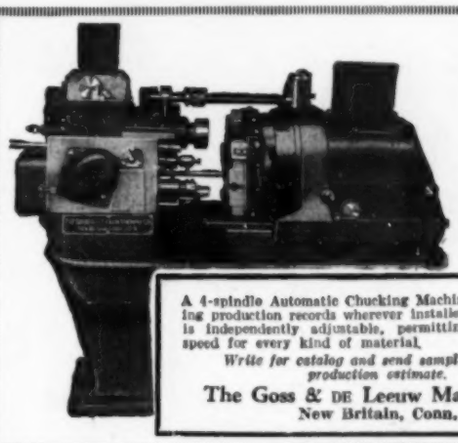

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A 4-spindle Automatic Chucking Machine that is breaking production records wherever installed. Each spindle is independently adjustable, permitting most efficient speed for every kind of material.

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If Your Cam Requirements

do not warrant the purchase of a Rowbottom Universal Cam Milling Machine you may obtain the Rowbottom high standards through our contract department.

Rowbottom and Cams

are inseparable. If you utilize cams in your product you will be interested in the Rowbottom Universal Cam Milling Machine. Send for your catalog today.

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This low cost machine will handle any keyseating job in the shop up to 1 in.

Write for illustrated bulletin.

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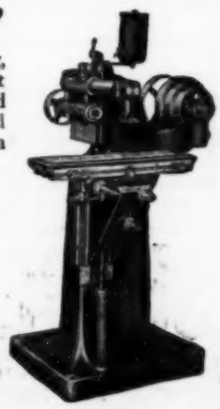
Don't make the mistake of using big, expensive milling machines on light jobs, where the U. S. Improved Hand and Weight Feed Milling Machine will give you greater and better production at infinitely lower cost.

Don't! It isn't logical. Bulletins on request.



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The United States Machine Tool Company
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PLANETARY
THREAD MILLER

For milling the largest threads on a production basis.

The Hall Planetary Co.
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MAKE PROFITS

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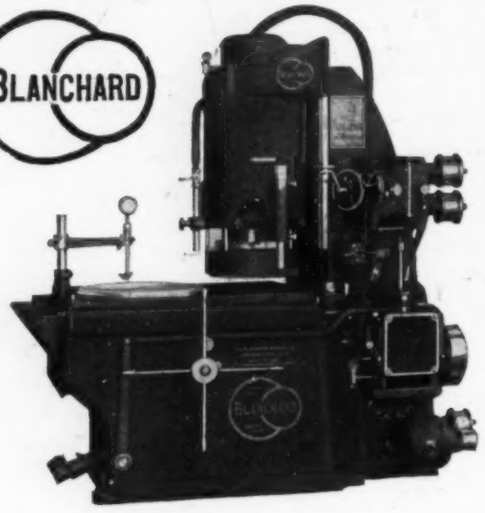
For Machining flat surfaces use the

BLANCHARD



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Great vertical capacity
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Makers of Automatic Cylindrical Grinders, Automatic Piston Ring Grinders and Automatic Face and End Grinders.

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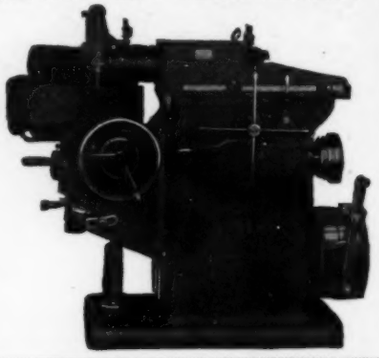

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Grinding Wheels

have been whipping the toughest of grinding jobs for over *sixty years.*

Today they're ready to prove what this vast experience can do toward reducing your grinding costs.

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for Perfect work at less Cost

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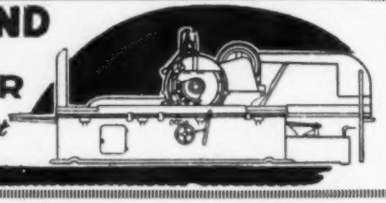

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Hole
Hole and Face
Deep Hole

See our advertisement in issue of May 19
Bryant Chucking Grinder Co.
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SHARP TOOLS CUT COSTS

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If You Use DIAMONDS
Use the DYKON GAGE
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LATHES — Blount — GRINDERS

Manufacturers of Grinders, Buffers, Speed Lathes and Manual Training Lathes.
For further information see larger "ads" 1st and 3rd issue of the month and write for catalog 22.
J. G. BLOUNT CO., Everett, Mass.

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Have the advantage of being the sole machine tool product of an organization of specialists. They possess correct design, unusual accuracy and are easy to operate. We make 14 in. Single Geared, 16 in., 20 in., 24-26 in. and 32 in. Back Geared Shapers. **Write for a Catalog.**

THE R. A. KELLY COMPANY Makers of Shapers only for 25 years.
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SHAPERS

simply designed but accurate and efficient

12-in. to 32-in. stroke (inclusive)
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Cincinnati, Ohio, U. S. A.

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Economies in production are made by keeping drilling machines on the job without constant attention and without interruption.

Leland-Gifford Co. builds high grade drilling machines with spindles, pulleys, in fact every moving or rotating part, running true and smooth. All parts are balanced with great care and this means greater production possibilities and longer life.

Leland-Gifford Drilling Machines are made to meet every individual production requirement.

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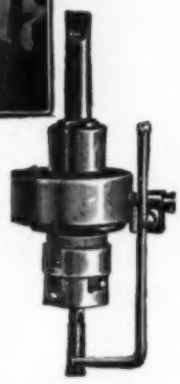
LELAND-GIFFORD

Errington Auto Reverse Friction Tapper

Style C.

Tapping Blind Holes in Air-Cooled Automobile Cylinder

(AMERICAN MACHINIST, Mar. 14, 1907)



The breakage of a single tap on this job would cause an intolerable blemish in the appearance of the piece and result in heavy loss in time and money. The Errington Sensitive Adjustment and Quick Reverse insure perfect results. Regulate the power of the machine to just drive and remove all danger of breaking the tool or injuring the work. Fool proof, fits any drill press, and taps steel as safely as cast iron. Seven sizes, 3/8 in. to 2 in.

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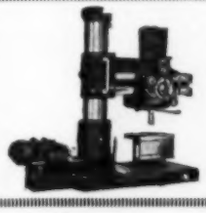
ABRASIVE SURFACE GRINDER

Either Horizontal or Vertical Spindle Type

Countershaft or Motor Drive

Get our bulletin for particulars.

ABRASIVE MACHINE TOOL CO., East Providence, R. I.



Five Years Satisfaction

The Carlton All Ball Bearing Radial Drill pleases its users. Has done so for **FIVE YEARS** and will continue to do so. Learn all its features and you'll see why.

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Since 1900

Surface Grinders, Tool and Cutter Grinders and New Yankee Drill Grinders

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Made in sizes from ¼ hp. to 5 hp.
Drills, Center Grinder, Hand Grinders.

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Plain Cylindrical, Universal and Valve Seat Grinding Machines.

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KNEE TYPE—RING WHEEL
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for all machines, 10" to 30".

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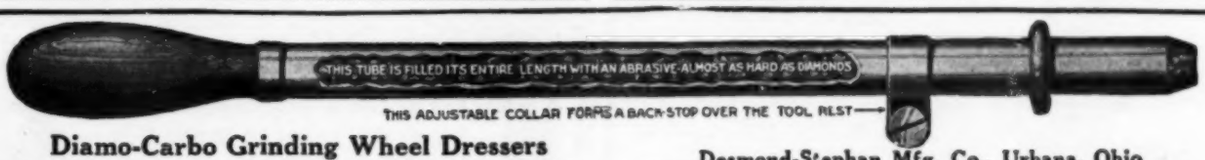
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Diamo-Carbo Grinding Wheel Dressers

—consist of a steel tube filled with an extremely hard abrasive. For some purposes they are as satisfactory as diamonds—at only a fraction of the cost. Try them at our expense.

Desmond-Stephan Mfg. Co., Urbana, Ohio

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Our bulletin shows our complete line. Write for a copy.

Just *start* the tap! Clean, fast work with FREW AUTOMATIC TAPPER

A pull on the lever, until the tap enters the hole—that's all the operator does. The tap requires no lead screws, but cuts its way to the required depth, then automatically reverses and withdraws.

The use of two sets of Timken Roller Bearings, and a short, thick spindle shaft positively prevent "cocking" of the tap. You get accurate, clean threads—quickly and easily.

Arranged for either belt or motor drive. Capacity ½ inch.

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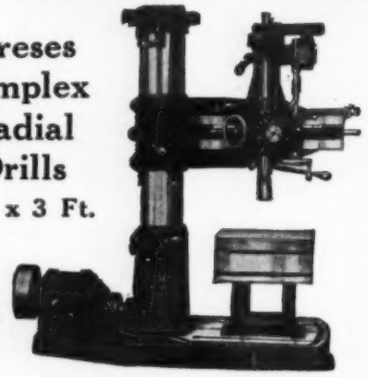
Dreses Simplex Radial Drills
2½ x 3 Ft.



A Drill That Invites Comparison with Any of Its Type.

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for profitable production

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With this machine the work is clamped, drilled with pressure feed in the shortest practicable time and finally ejected. All operations being entirely automatic after operator inserts work and depresses pedal.

Let us give you all the details of this profitable single spindle unit. Send a postal for a new catalog.

Kingsbury Manufacturing Co.
Keene, N. H.

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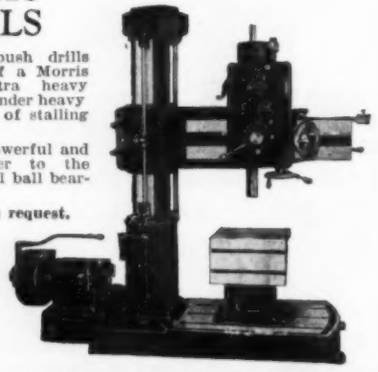
The operator can push drills held in the chuck of a Morris Radial through extra heavy work at high speeds under heavy feeds without danger of stalling or chatter.

Morris Radials are powerful and supply steady power to the spindle through an all ball bearing gear box.

Complete details on request.



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High Speed, Sensitive, Ball Bearing

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The Drill Spindle without Vibration

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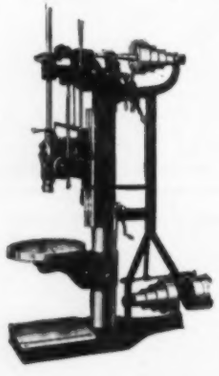

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Drilling an even dozen

When a prominent automobile concern wanted to cut production costs, they ordered a

U. S. MULTIPLE DRILL HEAD

This particular head drills 12 holes at a time. But we make any type to suit any particular need.

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DRILLING Machines of all types—Gang Drills, Sensitive Drills, Sliding and Stationary Head Drills, Horizontal Drilling, Boring and Tapping Machines, Multi-Spindle Auxiliary Drilling Heads, etc.

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Standardize on FOOTBURT *Drilling, Boring, Tapping Machines*

FOR PRODUCTION!

Leading manufacturers of Single and Multiple Spindle Drilling Machines, Cylinder Boring Machines, etc., and various types of special equipment.

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Speed up with HŒFER **Drilling Machines**

Their "minute-saving" features of design will greatly increase your drilling output and profits. Get the complete details from our branches in the principal cities.

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Vertical Boring and Drilling Machines
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Keyseaters.

BAKER BROTHERS Inc., TOLEDO, OHIO U. S. A.

See Display in First and Third Issue of Month

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Quiet— Vibrationless

—Ready for the Job

The elimination of gears in the design of the two Canedy-Otto Sensitive Drills pictured here, has meant a remarkable reduction of noise and vibration. Simplification throughout has resulted in a great reduction of friction. Smaller motors are used than have heretofore been practical with drills of their capacity.

Let us send you the complete specifications that describe in detail the features which make these drills unusually economical and dependable on high-speed work.

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General Offices and Factory: Chicago Heights, Ill.

San Francisco Branch:
955 Folsom St.,
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Combining all the flexibility and convenience of operation possible, the 14-in. Sliding Head Sensitive Drill, shown at the left, and the No. 20 sensitive Bench Drill, above, are typical of the Canedy-Otto Line. Unusual accuracy and speed is made possible by their highly simplified design. The capacity of the floor drill is 0-½-in.; of the bench drill 0-⅝-in.

The Complete Line Includes—

The Canedy-Otto Line includes—Automotive Equipment —Drills —Countershafts — Grinders —Buffers —Forges — Blowers—Tuyere Irons—Special Service Tools and Shop Equipment.

Complete 104-page Catalog upon request.

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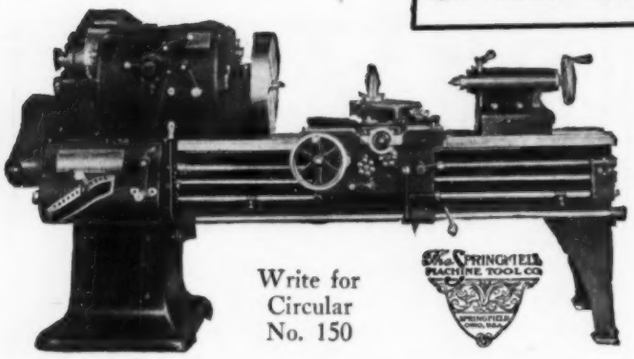

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These husky tools guarantee profits—they are built for production and will "stand the gaff."

No up-to-date feature is missing from their design and only those of proved value are used.

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"Small Lathes for Big Jobs"

Eight Inch Lathe

Actual swing, 8¼ in.
Between centers, 18½ in.
Length of bed, 36 in.
Hole in spindle, 1 1/16 in.
Collet capacity, ¾ in.

Can be supplied with floor mounting or for bench. Also with individual motor drive and complete line of attachments.

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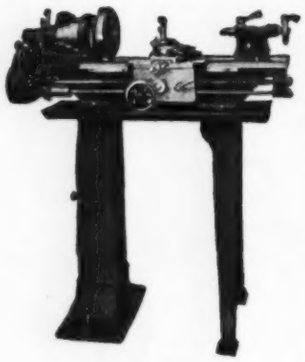

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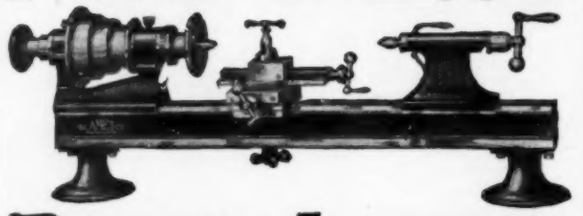

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BRADFORD LATHES

Cone or All-Geared Belt or Motor Drive

Sizes 14 to 42 inch

See full page ad First issue of each month.

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A modern high power, high duty production turret Lathe for bar or chucking work. Designed and built sufficiently powerful and rigid to enable use of greatest number of multiple cutters and thus insure rapid accurate and economical work. Why not write us for full particulars.

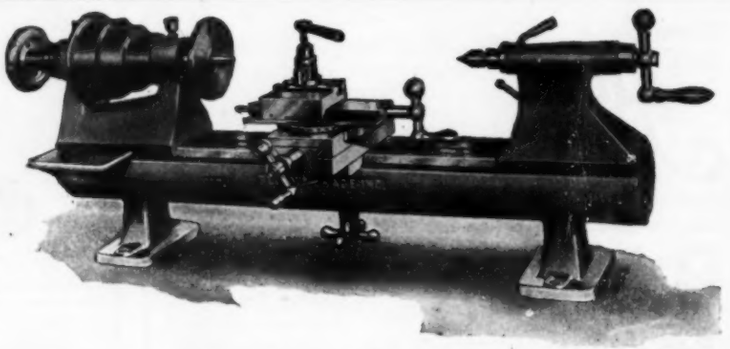
STEINLE TURRET MACHINE CO.
MADISON, WIS. U. S. A.

Equal to a Floor Lathe—and Costs Less

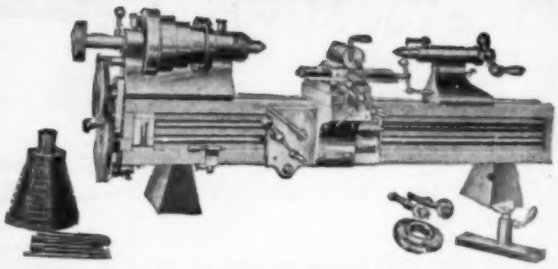
The S & C Bench Lathe

It has a ten-inch swing, a thirty-eight-inch bed and the spindle capacity is one and one-quarter inches. It will handle any work that the same capacity floor lathe will take.

New bulletin gives complete description.



SLOAN & CHACE, INC., 351 Sixth Ave., Newark, N. J.



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Especially built to meet the exacting requirements of tool rooms, experimental and model departments. When used with its full line of Rivett attachments it makes a unit capable of doing practically every shop operation adaptable to any kind of bench lathe. Ask for catalog No. 608.

Collets to Meet Your Needs

Collets in stock for all models of Rivett machines and for many other leading makes of bench lathes, engine lathes, grinders, millers, etc. A large number of the best known machine tool builders contract with Rivett for their collet supplies. "Rivett makes the best collets in this world!" Send for special booklet about collets.

Cuts Duplicate Threads Cheaply

The Rivett Thread Tool saves time on threading done on engine lathes particularly where a number of duplicate threads are to be cut. Far superior in every case to a single point threading tool. Can be attached to any make screw cutting engine lathe. Details?

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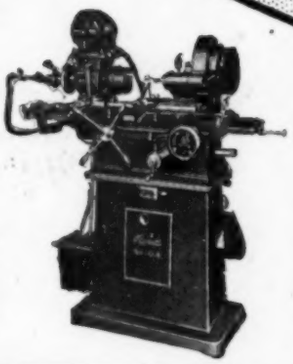
For Greater Grinding Efficiency

The New Rivett No. 104 Internal Grinder

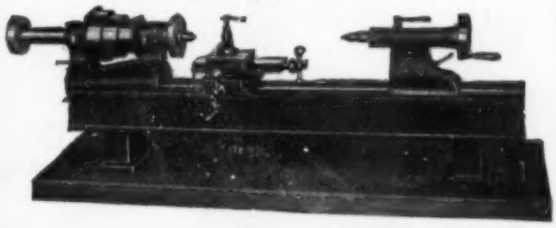
Inexpensive—efficient—complete.

For general tool room and production work—motor driven with automatic table travel, work head and water control—or the same machine simplified and countershaft driven. External attachments for either drive. Send for bulletin on this new machine.



The New Rivett Junior Bench Lathe No. 507

—junior in cost and in age but already the leader in its field. Designed without prejudice—built with experience—complete with attachments—priced for everyone. Rivett is very proud of this product. Send for its bulletin and hand book.



The Hjorth Lathe is busy all day—

This precision bench lathe handles light and medium jobs of turning, drilling, screw cutting, milling, etc. It's a versatile unit that will cut production costs because it is never idle.

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"Libby-International" Turret Lathes

Full Swing Side Carriage, Heavy Duty Type Machines, covering Bar Work from 2 in. to 12 in. and Chucking Work up to 32 in. in diameter. Dealers in all principal cities.

International Machine Tool Co., Indianapolis, Ind.

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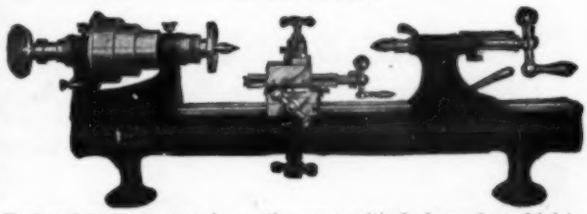
For Precision



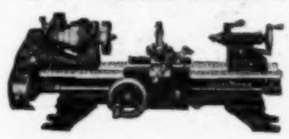
Tool and instrument makers—the most critical class of machinists in the trade—for 65 years have been using Stark Lathes with satisfaction.

The six sizes range from ¼-in. to 1¼-in. in collet capacity and up to 12-in. in swing.

STARK TOOL COMPANY, WALTHAM, MASS.

Established 1862 **Originators of American Bench Lathe**

New Model South Bend Jr. Bench Lathe



9-in. Swing Back Geared Screw Cutting LATHE as low as **$160.00**

Complete with Countershaft Equipment

A high quality screw cutting lathe capable of handling wide range of accurate work. Countershaft Drive or ½ H.P. Motor plugged from Lamp Socket.

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EASY TERMS IF DESIRED

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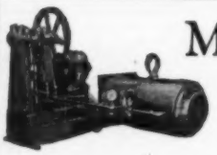

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A Portable Jack or Forcing Press does not cost as much

AND IT CAN DO A LOT OF THINGS THAT A STATIONARY WHEEL PRESS CANNOT DO

It goes to the work inside or outside of your plant.
It can be used in almost inaccessible places.
Any spread of bars can be rigged up with I Beam Resistance Heads.
Two Jacks can be operated with one pump and double the pressure.
In like manner equilibrium can be maintained for heavy or bulky lifting and THERE ARE A LOT OF OTHER OPERATIONS THAT CAN BE DONE IN A PINCH.
We use three in our own shop. Try one. Have sold one customer nine.

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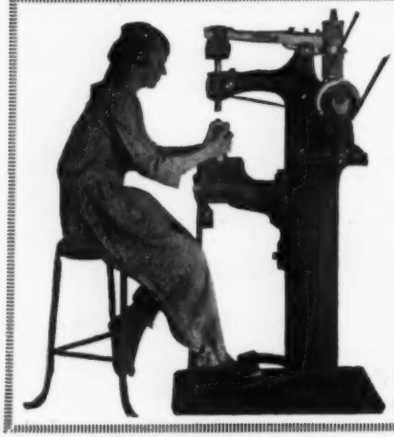

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(Patd.)

Cold Riveting 1/64 in. to 1¼ in. in diameter

Write for Catalog "C"
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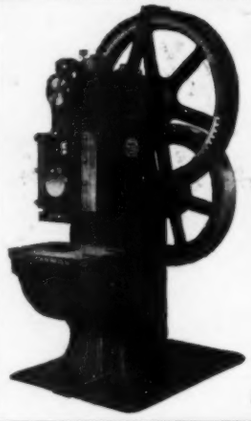

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Punch Presses

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WADE Toolmakers' Bench Lathe

The utmost in convenience and service for all work up to engine lathe capacity

Details on request.

THE WADE TOOL CO.
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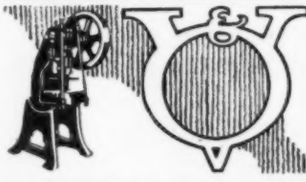

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A complete range of Punch Presses, including dial, magazine and roll feeds.

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SPEED AND MORE SPEED

is what you secure by turning your shafts by the

Lo-swing METHOD

SEND IN YOUR BLUE PRINTS
Seneca Falls Machine Co., Seneca Falls, N. Y.

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Flywheel type in 5 sizes—geared in Nos. 4 and 5. Write for complete information to the Federal Press Co., Elkhart, Indiana.

FEDERAL HEAVY DUTY, OPEN BACK INCLINABLE PRESS

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The design incorporates the most advanced principles of modern machine tool practice—backed by over fifty years' experience as specialists in this field.

Sizes from 14-in. to 26-in.

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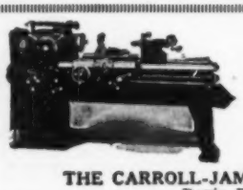

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We specialize in 13 in., 15 in. and 16 in. Geared and Cone Head Lathes.

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A Bliss Press characteristic

The 6-year record without a single repair or replacement for this Bliss Press is by no means exceptional. It is being duplicated or exceeded by thousands of other Bliss machines, all helping to make the manufacture of sheet-metal parts of every description economical in the highest degree.

Bliss economy means not only low maintenance cost, but also low operating cost and speedy production. Ask us to tell you more about the Bliss Press.

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No. 438

THE

"TOLEDO"

DOUBLE CRANK PRESSES

"Toledo" Double Crank Press, Series No. 90

THE "TOLEDO" Double Crank Presses are for cutting out and forming large articles in tin, brass, copper, sheet steel, cardboard, paper cloth, etc. Among these may be mentioned automobile parts: such as bodies, fenders, running boards, rear axle housings, chassis rails, etc. They can also be used to good advantage for multiple gang punching or perforating, and for operating several different kinds of dies, where special work requires a series of operations one after the other, or for operating duplicate dies in gangs. When fitted with shearing blades they can be used for squaring shears for special work.

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Insure Cleanly-Cut Stampings

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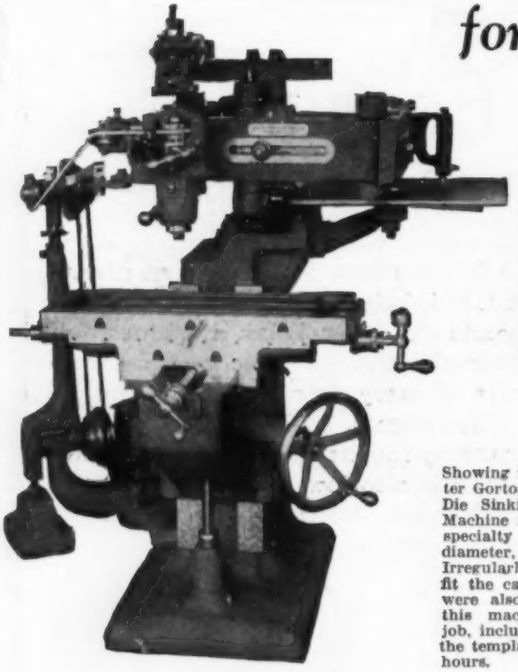

The No. 1-S Universal Die Sinking and Engraving Machine has a pantograph range of reductions from 1 to 1 down to 6 to 1. A precision machine embodying thirty years of manufacturing experience.

Suited to heavy engraving on flat or spherical surfaces, the Gorton No. 1-S Machine economically meets the demand for a heavy engraving machine suitable for cutting large, heavy dies, steel stamps, letters, gun work, and many similar jobs in steel, brass, and cast-iron.

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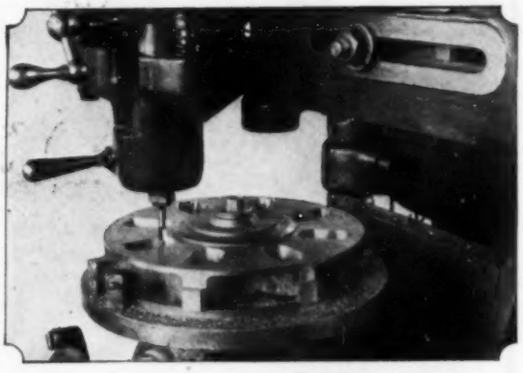
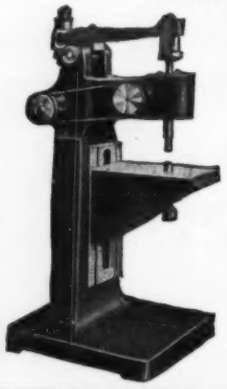


Showing the spindle and cutter Gorton Universal No. 1-S Die Sinking and Engraving Machine finishing of a brass specialty form, 14 in. in diameter, and 1½ in. deep. Irregularly shaped inserts to fit the cavities in this form were also shaped to fit on this machine. The entire job, including the making of the template, required twelve hours.

UNIVERSAL DIE SINKING and ENGRAVING MACHINE

TRADE MARK
GORTON
RACINE, WIS., U.S.A.

Just the thing for small riveting



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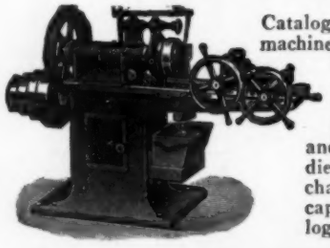
ACME BOLT CUTTERS



Catalog M will describe the machine in detail. Dies can be changed in less than a minute. Acme Die heads are lined with hardened tool steel and ground to size. The dies are made interchangeable with the steel caps. Write for Catalog M.

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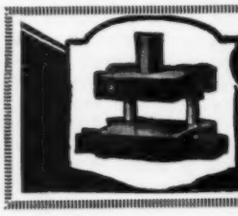
Ampere, East Orange, N. J.

US TOOL



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These chucks are made with either iron or steel bodies and in three or four jaw types. The jaws are reversible and operate universally or independently.

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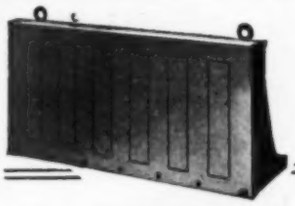

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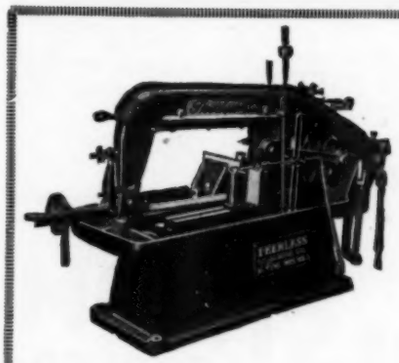

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"The Incomparable"

Specification No. 1—STRENGTH and RIGIDITY

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The strength of a chuck is not altogether in proportion to its weight. When gripping, the Jaws exert an immense strain on the central part of the body, and very little near the periphery. This is the reason that so many Chucks, even if the Bodies do not break, will spring enough to permit of the Jaws heeling, and explains why the "Incomparable" was designed on the truss principle, with all possible metal well towards the center of the Chuck.

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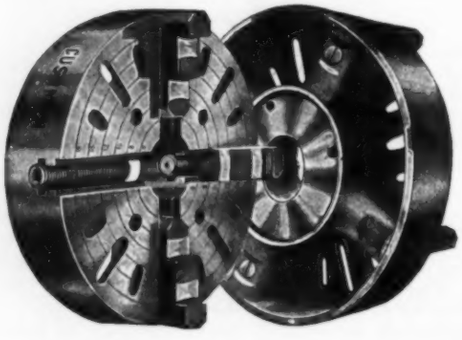
The weakest part of a chuck body used to be the ribs on which the Jaws slide. For this reason, the "INCOMPARABLE" ribs were made unprecedentedly strong and heavy, with the result that we have never known of one breaking.



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Nos. 34 and 36 Geared Scroll Chucks

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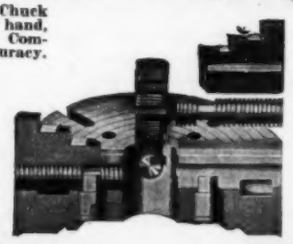
Every Chuck fitted by hand, insuring Complete Accuracy.



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Model 50

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The Federal "Fifty" Dial Indicator is graduated to read in .0005 in. the full range being 3 in. or ten complete revolutions of the hand. Can be had with either SAPPHIRE Jewelled Bearings or regular brass bearings. Graduations are alternately red or black which permits quick reading with a minimum of eye strain.

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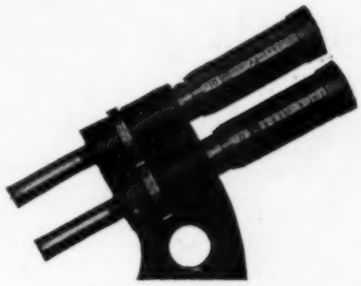

These instruments save time in production work—the minimum limit screw can be locked and the other left to revolve freely. One Slocomb Snap Gauge Micrometer will replace many dollars worth of snap and limit gauges.

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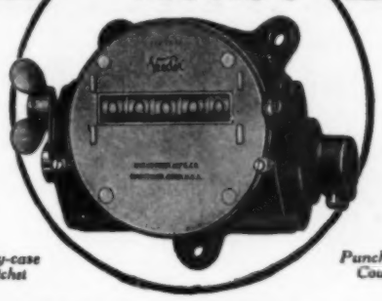

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ATTENTION centers on a *dial* where it scatters on the routine of machine-operating. The production-record on a Counter gets more attention from the worker than his job ever gets *without* one. The Veeder booklet shows the Counters to keep *your* machines tended up—as never before. Write—

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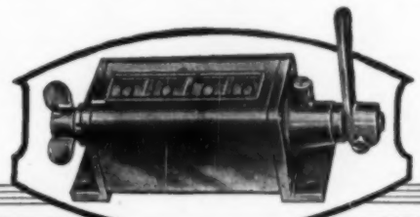

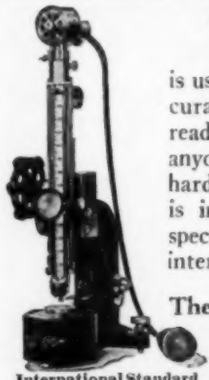

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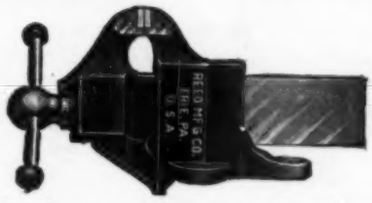

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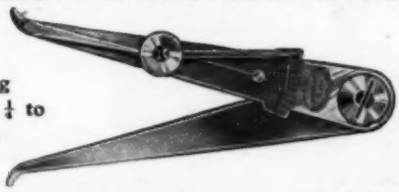

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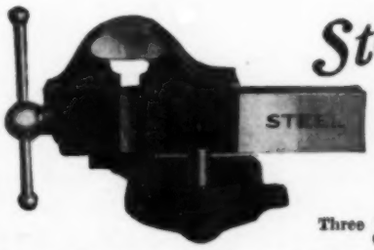

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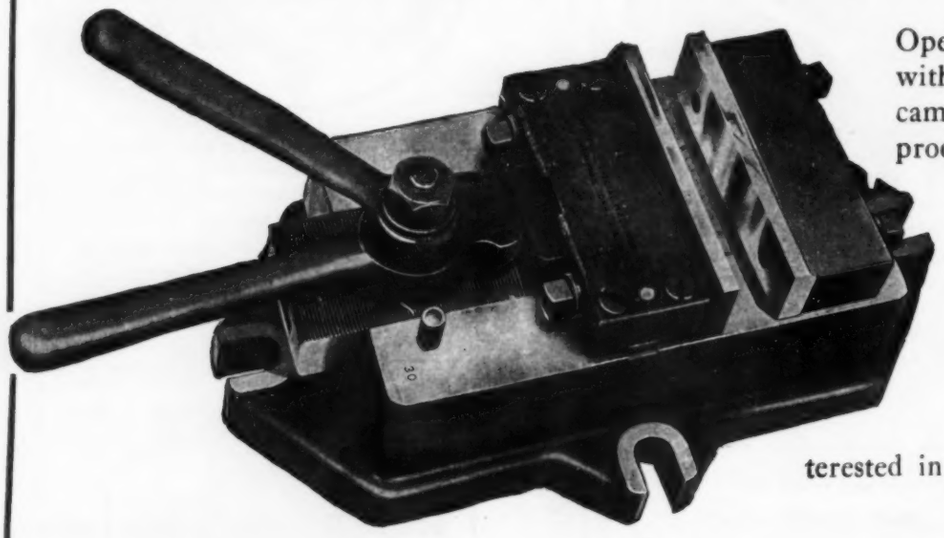
grabs a job like a Terrier; hangs on like a Bulldog; and lets go with the speed of a Hangman's Trap



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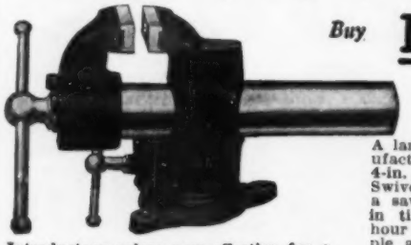

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Above prices F.O.B. Canal Fulton, Ohio

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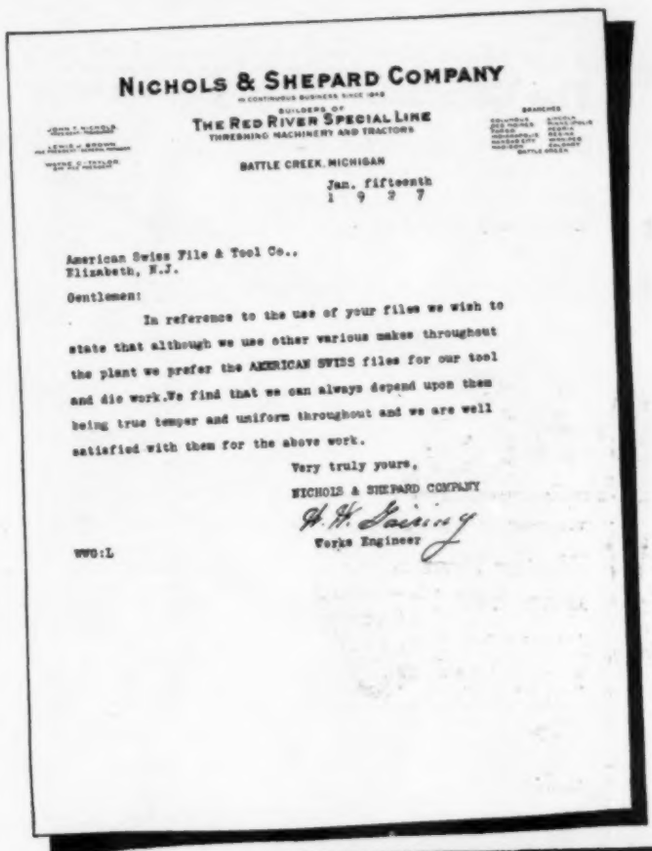

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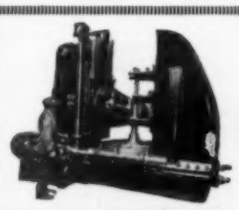

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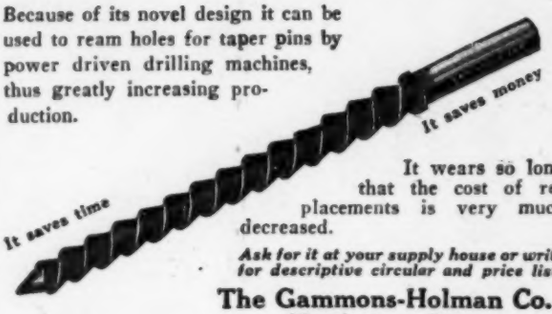

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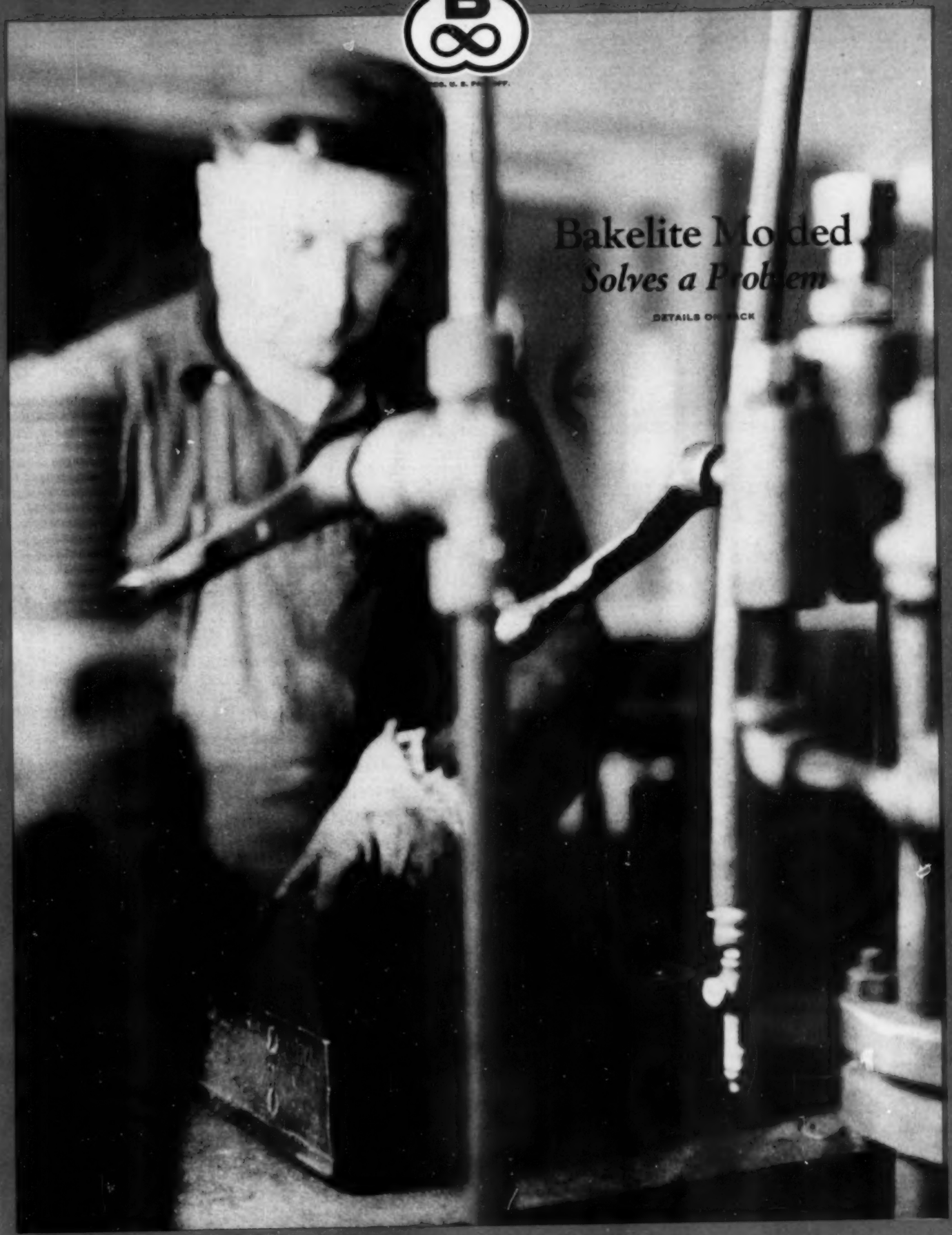

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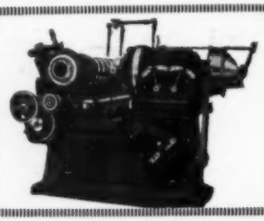

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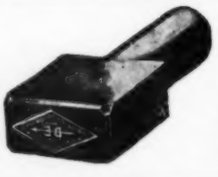

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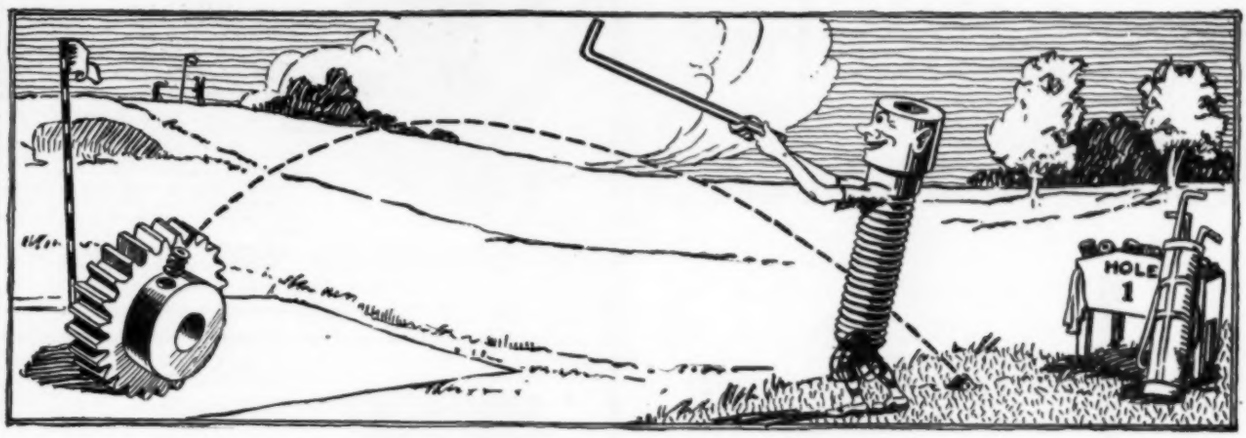

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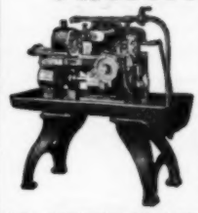

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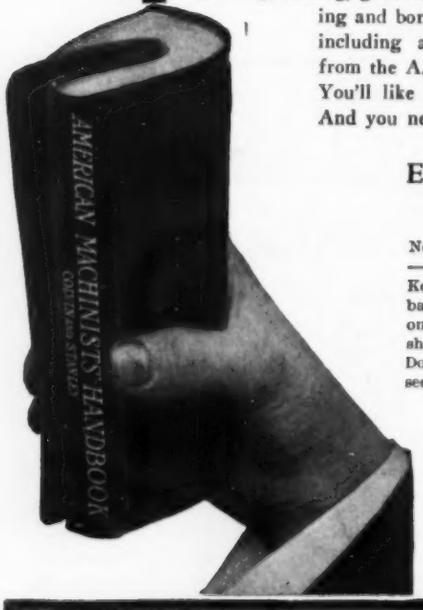

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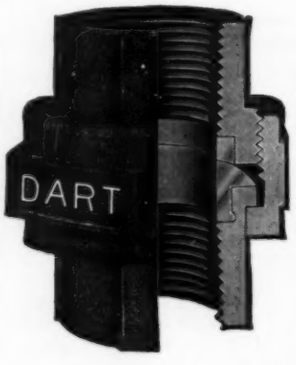

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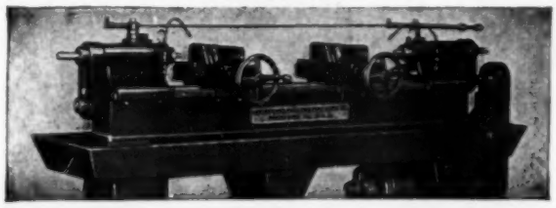

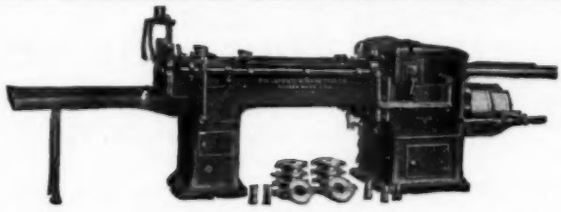

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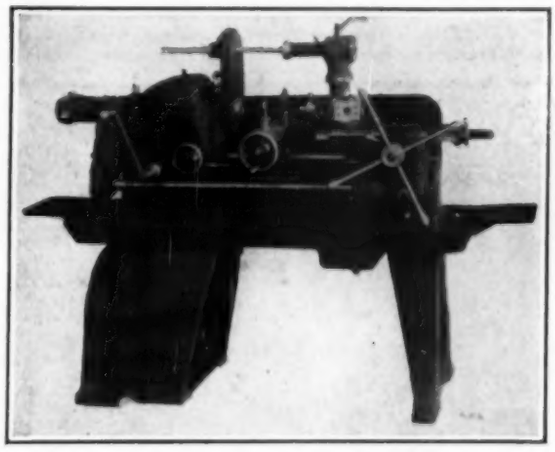

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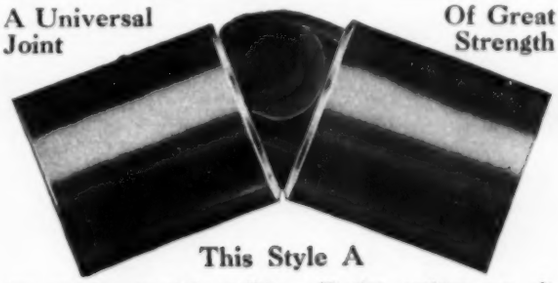

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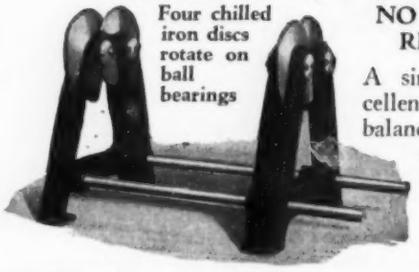

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Detroit is the center of mass production. Come and visit its mammoth plants. See how the other fellow does it.

There's just a few spaces left for exhibitors, and the first come first served. A word to the wise—!

In Detroit Same Week

Annual Meeting
American Society
for Steel Treating

Annual Meeting
American Welding Society

Annual Fall Meeting
Institute of Metals

Production Meeting
Society of Automotive
Engineers

9th
National Steel
& Machine Tool
Exposition
Convention Hall
DETROIT
September 19—23
Full information floor plans, rates, etc., from
American Society for Steel Treating
4600 Prospect Ave., Cleveland

a Big Week IN DETROIT

September 19 to 23

SEARCHLIGHT SECTION

USED MACHINERY & NEW—BUSINESS OPPORTUNITIES

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A.M.

POSITIONS VACANT

Colorado

WANTED as assistant superintendent in large western jobbing shop, having foundry, machine shop, boiler shop, etc.; young engineer thoroughly trained in practical operation of heavy machine tools and in modern methods of routing, bonusing, etc.; address, giving experience in detail. P-555, American Machinist, 7 South Dearborn St., Chicago, Ill.

Connecticut

A tool designer wanted who has had large experience in designing press tools for piercing, blanking, drawing and redrawing sheet metal. Position permanent and very attractive. Only a man of long and varied experience will be considered. Answer The E. J. Manville Machine Company, Waterbury, Connecticut.

New York

A COMPETENT mechanic and designer wanted; experienced in building small machinery for handling paper stock, to refine and perfect a patent model machine; must have first-class references; give full information in first letter, also state salary expected; we are located in New York City. P-558, American Machinist, Tenth Ave. at 36th St., New York.

LARGE manufacturing concern in northern New York State needs a man who has the ability, training, and talent to work out and develop production machinery problems; constant situation for a man that fits in; state experience, ability and age in first letter. P-561, American Machinist, Tenth Ave. at 36th St., New York.

Ohio

TOOL room foreman, must have real executive capacity. Must be experienced in the designing, estimating and supervising of die casting dies. This is a good paying permanent position for the right man. P-562, American Machinist, Guardian Bldg., Cleveland, Ohio.

Pennsylvania

LIVE production man and good mechanic familiar with latest methods; manufacturers of automotive equipment who can put over program of increasing output and reducing costs; permanent place for right man. P-554, American Machinist, 1600 Arch St., Philadelphia, Pa.

EMPLOYMENT AGENCY

POSITIONS open for mechanical engineers, works, managers, superintendants, production managers, draftsmen and designers. No registration fee. Free service to employers. Write Consolidated Agencies, formerly H. H. Harrison, 110 So. Dearborn St., Chicago.

EMPLOYMENT SERVICE

IF YOU are qualified for position between $2,500 and $25,000 and are receptive to negotiations for new connection, your response to this announcement is invited. The undersigned provides a thoroughly organized service, established sixteen years ago, to conduct confidential preliminaries, and assist the qualified man in locating the particular position he desires. Not an employment agency. Retaining fee protected by refund provision, as stipulated in our agreement. Send name and address only for description of service. B. W. Bixby, Inc., 266 Main Street, Buffalo, New York.

AMERICAN Machinist readers find our individual confidential service effective in making new connections. Personally planned by Jacob Penn, the eminent employment authority. Refund agreement. Not agency. Jacob Penn, Incorporated, 816 Parkmurray Bldg., New York.

POSITIONS WANTED

Connecticut

FACTORY manager, superintendent, engineer; twenty years' varied experience in above responsible positions, covering all phases of manufacturing, on small to medium sized, high grade products; development, production, engineering; technical graduate, superintendent at present, desires change. PW-557, American Machinist, Tenth Ave. at 36th St., New York.

PRACTICAL, mechanical engineer, 18 years' experience shop, designing, chief engineer, assistant manager training, knowledge of patents, able development man. Age 36. PW-551, American Machinist, Tenth Ave. at 36th St., New York.

Massachusetts

TOOLROOM foreman available August 1; 20 years' experience on tools, jigs, dies, gages and special machinery; married, sober and steady. PW-560, American Machinist, Tenth Ave. at 36th St., New York.

New York

GENERAL foreman or works superintendent now available; thoroughly competent to get out production; practical die, tool maker and general mechanic; vicinity New York. PW-478, American Machinist, Tenth Ave. at 36th St., New York.

WORKS manager or superintendent, manufacturing executive, experienced on machine tools, special machinery, reciprocating and centrifugal pumps, technical education, thorough knowledge of production methods. PW-544, American Machinist, Tenth Ave. at 36th St., New York.

POSITIONS WANTED

Ohio

MANAGER, superintendent or similar position, wide and varied experience; have initiative, sound judgment, good mechanic and executive with record of results; at present employed. PW-559, American Machinist, Guardian Bldg., Cleveland, Ohio.

SUPERINTENDENT, works manager or master mechanic; information regarding twenty years' varied experience in manufacturing plants, cheerfully given; but its relevant importance is minimized, as an executive position is wanted; not one strictly technical; and the field of a real executive is universal. W. Lethart, Box 560 Central Station, Toledo, Ohio.

Wisconsin

MECHANICAL engineer, 40, capable, practical man, wide experience shop and office, drafting room, etc., automotive design and construction, automatic machinery, tools, electric apparatus, etc., desires responsible position that will keep him in touch with shop. PW-541, American Machinist, 7 So. Dearborn St., Chicago, Ill.

SALESMAN WANTED

Eastern Territory

Wanted—an experienced machinery salesman to sell high-grade automatic metal working machinery in the Eastern territory. Must be thoroughly familiar with sheet metal and wire working machinery. Position permanent and splendid opportunity for one who can give results. Give full details in application. The E. J. Manville Machine Co., Waterbury, Conn.

SALESMAN AVAILABLE

MACHINE tool salesman, thoroughly practical with years of selling experience, at present with old established machine tool manufacturer. SA-556, American Machinist, Tenth Ave. at 36th St., New York.

AGENCIES WANTED

Dealer in Machine Tools

and production equipment traveling four salesmen New York territory, well established and financially responsible, seeks several good additional lines; correspondence invited. AW-520, American Machinist, Tenth Ave. at 36th St., New York.

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PATENTS, trademarks, designs, copyrights. Free preliminary advice. Registered patent attorney, former examiner in U. S. Patent Office. Albert L. Jacobs, Barrister Building, Washington, D. C.

WANTED

Tool and Die Draftsmen

With Designing Experience

For work on small interchangeable parts.

ROYAL TYPEWRITER CO., INC.,
150 New Park Ave., Hartford, Conn.

AVAILABLE AUGUST 1st

Sales Engineer—8 years' experience; 30 years of age; married; at present in charge of Detroit territory for large Eastern tool company, desires to make a change for the better. Aggressive and thoroughly acquainted with shop and purchasing personnel of factories in Detroit and vicinity. Would consider any reasonable proposition relating to factory supplies or equipment.

PW-552, American Machinist
Tenth Ave. at 36th St., New York City

WANTED

SALESMAN

by large concern in the middle west. Must be thoroughly familiar with sheet metal working presses. Apply stating experience and salary expected to

AS-548, American Machinist
Guardian Bldg., Cleveland, O.

Peremptory Auction Sale

Machinery and Equipment of

J. W. Paxson Co.

Foundry Equipment

Luzerne and D Sts., Phila., Pa.

THURSDAY, JULY 14, 1927, AT 10 A. M.

On the Premises

The sale comprises the equipment of boiler, blacksmith and carpenter shops as well as foundry supplies and includes combination punch shears, sheet metal bending machines, rotary plate power shears, power punch presses, bevel shears, power plate flanging machine 12 ft. 6 in., rotary bevel shears, radial and upright drill presses, grinders, lathes, planers, shapers, riveters, milling machines, pipe cutting and threading machine, steam hammers, hydraulic bar and angle bending presses, wood working machine, A.C. electric motor, sheet metal, etc.

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FOR SALE

Automatic Die Cutting Machine

1—Type F-Keller, complete with electric control equipment, in first class condition.

THE MILLER RUBBER COMPANY,
Akron, Ohio

WANTED

WANTED

⅝-in Cold Header Waterbury-Farrel or Manville Double Stroke Solid Die Crank Type Preferred to Knuckle Joint.

Advise **FAULTLESS CASTER COMPANY,**
Evansville, Indiana

WANTED

INGERSOLL MILLER

2 vertical and 2 horizontal side spindles, at least 24 inches high, 36 inches wide, and 8 ft. base.

Dutchess Tool Co.
Beacon, N. Y.

NEW TOOLS AT LOWERED PRICES

2—No. 11 Gleason Automatic Gear Generators, motor driven, complete with change gears and tools.

1—Model 61 Fellows Gear Shaper, motor driven, complete with cutters.

Full details and prices on application.

TRAYLOR ENGINEERING & MANUFACTURING CO.
Dept. MS
Allentown, Pa.

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MISC. PLANT EQUIPMENT
MACHINE TOOLS
COMPLETE MONO-RAIL SYSTEM
CHAIN HOISTS
VICES—CHUCKS—PULLEYS
SEAMLESS STEEL TUBING
HIGH SPEED SMALL TOOLS CARBON
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SANDUSKY TRACTOR AND ENGINE
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TOOL STEEL, HIGH SPEED AND CARBON
HIGH SPEED TOOL STEEL SCRAP
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MERCHANT PIPE AND COUPLING
AUTOMOTIVE PARTS
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GREASE CUPS—LUBRICATORS
BRONZE AND BRASS BUSHINGS
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Attorney-at-Law and Solicitor of Patents
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seeks the experiences of others to associate with his own knowledge, for the best solutions of his business problems. One-man viewpoint has long succumbed to the open-mind policy in plants whose methods have proven successful.

The Professional Consultant brings to you a wide and varied experience on which to base a solution to your business troubles.

Consult the Advertisements on this Page for the Services you require!

TO buy your machine tools from this list, means many dollars saved. And a dollar saved is a dollar earned, you know.

HIGH GRADE * READY TO PRODUCE * GUARANTEED

ReMANUFACTURED -(ORIGINATED BY US)- MACHINE TOOLS

Reg. U. S. Pat. Off.

Lathes

1—56-64-in.x18-ft. Johnson.
1—33-51-in.x42-ft. LeBlond.
1—33-51-in.x20-ft. LeBlond.
1—45-in.x24-ft. Pond.
3—40-in.x12-ft. Fifield.
1—36-in.x42-ft. Gisholt Gun Boring.
2—36-in.x52-ft. LeBlond, M.D.
3—36-in.x37-ft. N.-B.-P. M.D.
2—36-in.x30-ft. Pittsburgh, G.H.
1—36-in.x24-ft. Pittsburgh, G.H.
1—36-in.x20-ft. Pittsburgh, G.H.
1—32-in.x12-ft. Pittsburgh.
1—30-34-in.x12-ft. Lodge & Shipley selective head.
2—30-in.x11-ft. H. S. & G.
2—27-in.x14-ft. Reed-Pren., G.H.
2—26-in.x18-ft. Bridgeford.
5—26-in.x16-ft. N.-B.-P.
2—26-in.x16-ft. Whit.-Blaisdell.
10—26-in.x16-ft. Bridgeford.
5—26-in.x14-ft. Bridgeford.
5—26-in.x14-ft. N.-B.-P.
2—26-in.x13-ft. Wickes.
3—26-in.x12-ft. Putnam.
5—26-in.x12-ft. Bridgeford.
13—26-in.x11-ft. Wickes.
30—26-in.x10-ft. N.-B.-P.
21—26-in.x10-ft. Canada.
15—26-in.x10-ft. Whit.-Blaisdell.
44—26-in.x10-ft. Bridgeford.
61—26-in.x 9-ft. Bridgeford.
16—26-in.x 8-ft. Bridgeford.
12—25-in.x12-ft. LeBlond.
3—25-in.x10-ft. LeBlond.
20—25-in.x10-ft. Sidney.
1—24-in.x20-ft. Reed-Pren., G.H.
1—24-27-in.x18-ft. Lodge & Shipley, selective head.
1—24-in.x12-ft. Monarch.
1—24-in.x12-ft.Reed-Pren., G.H.
9—24-in.x10-ft. Cisco.
10—21-in.x10-ft. LeBlond.
5—20-22-in.x16-ft. American.
5—20-22-in.x12-ft. American.
3—20-22-in.x8-ft. American, M.D.
30—20-22-in.x8-ft. American.
2—20-in.x 8-ft. LeBlond.
2—19-in.x 8-ft. LeBlond.
1—18-in.x14-ft. American, G.H.
1—18-in.x14-ft. Reed-Pren., G.H.
1—18-in.x10-ft. American.
1—16-in.x14-ft. American, G.H.
1—16-in.x14-ft. Reed-Pren., G.H.
2—16-in.x 8-ft. American, G.H.
2—16-in.x 8-ft. American.
1—16-in.x 8-ft. Monarch.
3—16-in.x 6-ft. Walcott.
1—16-in.x 6-ft. Sidney.
2—14-in.x 8-ft. Pratt & Whitney.
2—14-in.x8-ft. Carroll-Jamieson.
2—14-in.x 6-ft. Carroll-Jamieson.
4—8-in. Fitchburg Loswing.
10—3½-in. Fitchburg Loswing.

Shapers

1—16-in. Gould & Eberhardt, M.D.
1—24-in. American, M.D.
1—32-in. Cincinnati.

Gear Cutters and Hobbers

1—No. 36 BM Gould & Eberhardt.
1—24-in.x12-ft. Gould & Eberhardt.
3—No. 18-H Gould & Eberhardt.
1—No. 62 Fellows.
13—No. 6 Fellows.
1—No. 5 Lees-Bradner.
1—No. 1 Schuchardt & Schutte.
1—No. 3 36-in. Brown & Sharpe.

Drill Presses

1—No. 30 Natco.
1—No. 6 3-spdl. Moline Hole Hog.
1—No. 24 Foote-Burt.
1—No. 310 Baker Comp. Table.
1—28-in. Rockford, sliding head.
1—28-in. Cincinnati-Bickford.
1—22-in. Barnes All Gd. Mfg.
1—20-in. Leland-Gifford.
1—15-in. Avey Tool Room.

Presses

1—96-G Toledo Double Crank.
2—No. DGG-56 Ferracute, Gd.
5—No. 58 Toledo Nosing.
1—No. 57 Toledo Nosing.
1—No. 163½ Toledo Toggle.

Profilers

2—Pratt & Whitney, Auto.
34—2-spdl. Newton.
8—No. 1, 2 spdl. Garvin.
14—2-spdl. Betts.

Grinders (Cont'd)

1—12x36-in. Cincinnati Univ.
1—No. 70 Heald Internal.
1—No. 10-A Bryant Internal.
1—Modern Internal.
1—No. 6 18-in. Besly Ring Wheel.
1—No. 1 Cincinnati Univ. Cutter.

Planers

1—72x56-in.x36-ft. Cincinnati, 2 Hds.
1—60x48-in.x30-ft. Hamilton.
1—42x42-in.x22-ft. D. & H.
1—42x42-in.x9-ft. N.-B.-P.

Our Guarantee

Your money back if you return a machine within thirty days, freight prepaid. No excuses necessary.

Horizontal Boring Machines

TABLE TYPE

1—No. 3-A Universal.
1—2-spdl. Espen-Lucas Boring, Milling and Drilling Machine.
1—No. 3 Beaman & Smith Engine Frame and Cylinder Borer.
1—Beaman & Smith Cylinder Boring and Milling Machine.
5—No. 1 Barrett.
5—Rockford.

FLOOR TYPE

1—No. 1½ Beaman & Smith.
1—No. 1½ Giddings & Lewis.

Grinders

1—24x96-in. Norton.
1—20x96-in. Landis.
1—18x96-in. Norton.
3—14x72-in. Norton.
2—14x50-in. Norton.
1—12x120-in. Landis.
2—12x36-in. Modern.
3—12x36-in. Fitchburg.
1—10x96-in. Norton.
1—10x72-in. Landis.
3—10x72-in. Norton.
1—10x52-in. Landis.
3—10x36-in. Norton.
2—10x24-in. Norton.
6—6x32-in. Norton.
4—22-in. P. & W. Surf.
3—36x36-in.x18-ft. Cincinnati.
1—36x36-in.x12-ft. Woodward & Powell, 2 Hds.
1—36x30-in.x20-ft. Whit.-Blaisdell.
1—36x30-in.x18-ft. Whit.-Blaisdell.
1—36x36-in.x12-ft. Gray.
1—30x30-in.x14-ft. N.-B.-P.
1—30x30-in.x8-ft. N.-B.-P.
1—30x30-in.x8-ft. Cincinnati.
1—24x24-in.x6-ft. Rockford.

Thread Millers

7—No. 3-E Lees-Bradner.
2—No. 3 Lees-Bradner.
1—Holden-Morgan.
3—HM Foster.

Slab Milling Machines

1—32x32-in.x12-ft. Ingersoll.
1—24x13-in.x20-ft. Ingersoll.
1—24x24-in.x8-ft. Ingersoll.
6—24x24-in.x12-ft. Ingersoll.
1—No. 3 92x54-in.x15-ft. Beaman & Smith Milling and Boring Machine, Planer Type.
1—Beaman & Smith Open Side.
1—3-spdl. Beaman & Smith.

Vertical Boring Mills

5—72-in. Gisholt.
1—72-in. Cincinnati.
1—52-in. Gisholt.
1—48-in. Colburn.
1—30-in. Bullard.
1—24-in. Bullard Rapid Prod.

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651 W. Washington Boulevard, Chicago

Cable Address: REMAND **Phone Haymarket 7660**

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1—5-ft. Western Heavy.
2—3-ft. American Sensitive.

Automatic Screw Machines

2—No. 6-A Potter & Johnston.
1—No. 2-P Potter & Johnston.
1—⅞-1¼-in. Cleveland.
1—⅝-⅞-in. Cleveland.

Hand Screw Machines

1—No. 10 3-in. Bardons & Oliver.
3—No. 8 Warner & Swasey.
1—No. 6 2¼-in. Warner & Swasey.
1—No. 4½ 1¾-in. Bardons & Oliver.
1—No. 4 1⅝-in. Milholland.
1—No. 4 1½-in. Warner & Swasey.
2—No. 4 1½-in. Bardons & Oliver.
7—No. 3 1 5/16-in. Foster.
1—No. 3 1¼-in. Bardons & Oliver.
1—No. 2 1 1/16-in. Foster.
1—1x15-in. Pratt & Whitney.
No. 2 ⅝-in. Pratt & Whitney.

Turret Lathes

1—26-in. Libby.
9—25-in.x10-ft. LeBlond Univ.
26—24-in. Davis.
2—24-in. Steinle.
1—No. 3 Cincinnati Acme Univ.
1—24-36-in. Gisholt Gap.
1—24-in. Gisholt.
2—21-in. Gisholt.
26—21-in.x10-ft. LeBlond Univ.
3—20-in.x8-ft. American.
25—19-in.x8-ft. LeBlond.
24—19-in.x8-ft. LeBlond Univ.
2—18-in. Libby.
1—3x36-in. Acme flat turret.
1—3x36-in. Jones & Lamson.
2—2-spdl. Jones & Lamson.
1—16-in. Dreses Brass.
1—15x7-in. Bardons & Oliver.
2—14-in. Foster.
1—1½-in. Pratt & Whitney.

Milling Machines

1—No. 3-B Milwaukee.
4—No.3 Kempsmith.
1—No. 3 Cincinnati.
1—No. 2-B Heavy B. & S.
1—No.2 Kempsmith.
1—No. 3-B Milwaukee Univ.
21—No. 3 Garvin.
16—No. 1 Van Norman, Hand.
31—No. 0 Bristol.
1—Pratt & Whitney, Cam.
1—Type B Briggs.
1—18-in. Cincinnati, Auto.
7—Putnam Semi-Auto.
175—P. & W. Hendey, Becker and Garvin Lincoln Millers.

Vertical Millers

2—Model ACS 2-spdl. Becker.
2—Model SD Becker.
2—No. 6 Becker.
1—No. 5-C Becker.
2—No. 5-B Becker.
1—Model CS Becker.
1—Model B Becker.
6—No. 3 Brown & Sharpe.
1—No. 3-B Milwaukee.
1—No. 3 Becker.
1—Model AB Becker.
1—No. 2-B Milwaukee.

Miscellaneous

1—½-in. Rickert & Shafer Tapper.
1—20-24 Dill Slotter.
1—6-in. Newton Slotter.
18—Pilton Slotters.
1—No. 3-B LaPointe.
3—No. 4 LaPointe.
1—No. 4 J. N. LaPointe.
1—2-spindle Hoefer Cylin. Borer.
1—30-ton Lucas Forcing Press.

The Metal Working Industry has recognized that Simmons offers big savings and satisfactory results in—

SIMMONS "RESTORED" MACHINES

AUTOMATICS

2—No. 2G Brown-Sharpe.
2—No. 0 Brown-Sharpe.
5—No. 00 Brown-Sharpe.
3—2¾-in. Gridley, 4 Spdl.
6—⅞ Gridley four spindle.
1—¾-in. Gridley, 4 Spdl.
9—2¼-in. Gridley Single Spdl.
2—3¼-in. Gridley Single Spdl.
4—4¼-in. Gridley Single Spdl.
1—No. 6-A Potter-Johnston.

GRINDERS

2—No. 16 Blanchard Vertical.
1—14x96 Norton Cylindrical.
1—16x48 Landis Crankshaft.
3—14x50-in. Norton Cylindrical.
6—6x32 Norton Cylindrical.
1—14-in. Pratt-Whitney Vertical.
1—30x84 Diamond Face.
2—16x52 Landis Plain.
5—No. 70 Heald Internal.
5—No. 65 Heald Grinders.
5—No. 60 Heald Grinders.
1—No. 13 Brown-Sharpe Universal.

DRILLS

2—7-ft. Western Heavy Duty.
1—6-ft. Niles-Bement-Pond Univ.
1—6-ft. Bickford Universal Radial.
3—5-ft. Western Heavy Duty.
2—4-ft. Hammond Plain.
1—5-ft. N.-B.-P. Semi-Universal.
1—3½ Cin.-Bickford gear box.
2—3-ft. Mueller Plain.
1—3-ft. Western Plain.
1—No. 32 Nateo Multiple Spindle.
1—No. 14 Nateo Multiple Spindle.
6—No. 13 Pratt-Whitney Mult. Spd.
1—No. 4 Baush Multiple Spindle.
1—No. 1 Pratt-Whitney Deep Hole Driller.
3—42-in. Cin.-Bickford S.H. Drills.
2—32-in. Aurora S.H. Drills.
2—26-in. Barnes All Geared Drills.
5—Four Spindle Henry-Wright BB.
3—24-in. Cincinnati S.H. Tapping.
1—3-spindle Allen Ball Bearing.
1—3-spindle Henry-Wright Ball Bearing.
1—No. 1-S Garvin Duplex.

LATHES

5—10x5 Pratt-Whitney Tool Room.
3—14x6 Hendey Tool Room.
3—14x6 Hendey, Tool Room.
6—16x6 Hendey, Tool Room.
1—18x8 Hendey Tool Room.
2—18x8 Greaves-Klusman G. Hd.
1—18x8 Lodge-Shipley Heavy Duty.
1—18x36x12 Rahn-Larmon Gap.
1—20x42x6 Fay Scott Gap.
1—24x10 American Geared Hd.
1—25x12 LeBlonde Heavy Duty.
1—26x22 Boye-Emmes Motor Drive.
1—27x18 LeBlonde Heavy Duty.
2—30x12 American Geared Head.
1—30x60x12 McCabe 2 in 1.
1—30x14 Lodge-Shipley cone drive.
1—30x20 Pond Triple Geared.
1—36x29 American Geared Head.
1—36x70 American Geared Head.
2—36x20 American Geared Head.
1—36x60 Bridgeford Boring.
1—42-in. N.-B.-P. Car Wheel.
1—42x22 American Geared Head.
8—42x39 Putnam Geared Head.
1—44x34 Pond Triple Geared.
2—48x36 Pittsburgh Motor Drive.
2—50x36 Pittsburgh Geared Head.
2—54x34 Bement Triple Geared.
1—60x35 Bement Triple Geared.
1—72-in.x56-ft. N.-B.-P. Triple Gd.
1—LeBlonde Crankshaft.

PEDIGREED STOCK

Easily the finest values we have been able to present in months. Wire for photographs.

MILLERS

1—No. 5 Cincinnati Plain Latest
1—No. 4 Cincinnati Vert. Latest
3—No. 2-B Milwaukee Plain

PLANERS

1—72x72x16-ft. D. & H. Openside.
1—60x60x26-ft. D. & H. Openside.
1—62x62x14-ft. Cincinnati M.D. 4.
1—42x42x12-ft. Woodward-Powell.
1—36x36x20-ft. Woodward-Powell.
1—36x36x12-ft. N.-B.-P. 4 hds.
4—30x30x12-ft. N.-B.-P. 2 hds.
1—26x26x6-ft. Gray. Heavy Duty.
6—24x24x10-ft. Whitcomb-Blaisdell.
1—24x24x8-ft. Whitcomb-Blaisdell.
1—24x24x6-ft. Powell Hi Speed.

MILLERS

1—No. 5 Cincinnati Intermittent Feed.
1—No. 5 Cincinnati H.P. Plain.
1—No. 4 Cincinnati H.P. Plain.
1—No. 4-G LeBlonde Plain.
1—No. 3 Cincinnati H.P. Plain.
1—No. 3-H LeBlonde Plain.
1—No. 3-A Brown-Sharpe Plain.
1—No. 2 Hendey Geared Head Plain.
1—No. 2—A8 Milwaukee Plain (new).
1—No. 1 Brown-Sharpe Universal.
1—No. 1½ Brown-Sharpe Universal.
1—No. 2 Kempsmith Universal.
1—No. 5 Brown-Sharpe Vertical.
1—No. 4 Cincinnati Vertical.
1—No. 4 Cincinnati Intermittent Feed.
1—No. 3 Cincinnati Vertical.
1—No. 1½-B Milwaukee Vertical.
1—No. 2½-B Milwaukee Vertical.
1—No. 20 & No. 22 Garvin Vertical.
2—24x24x6-ft. Ingersoll.

SHAPERS

1—28-in. Queen City.
1—24-in. Gould-Eberhardt Shaper.
1—24-in. Cincinnati.
1—20-in. American.
1—16-in. Smith-Mills.
1—16-in. American.
2—15-in. Potter-Johnston.

SCREW MACHINES

1—26-in. Libby Turret Lathe.
5—18-in. Libby Turret Lathes.
16—No. 4 Warner-Swasey Turrets.
3—No. 2 Warner-Swasey Screw Mch.
5—2x26 Pratt-Whitney Turrets.
1—34-in.x24-ft. Gisholt Turret.

BORING MILLS

6—24-in. Bullard New Era.
1—36-in. Bullard New Era.
1—36-in. Bullard Rapid Production.
1—42-in. Bullard Two Swivel Heads.
1—54-in. Colburn Two Swivel Heads.
2—72-in. N-B-P Rapid Traverse.
1—96-in. Cincinnati Vert. Rapid Traverse.
1—84-in. Pond Extra Heavy, Two Heads.
1—10-16-ft. Niles Vert. Exten. Mill.
1—5-in. Bar Beaman-Smith Horizontal.
1—No. 3 Barrett Cylinder.
1—No. 2 Rockford Horizontal.
1—No. 2 Rochester Horizontal.
1—No. 0 Niles Horizontal.
1—7-in. Bar Newton Horizontal Mill.

MISCELLANEOUS

1—2-in. Acme Bolt Cutter.
1—8-in. Bignall-Keeler Pipe Mch.
1—Imperial Type XB Air Comp.
1—No. 4 LaPointe Broach.
1—No. 3 LaPointe Broach.
1—No. 3 Pratt-Whitney Die Sinker.
5—6-in. Gleason Gear Generators.
9—18-in. Gleason Gear Generators.
3—5-A Lees-Bradner Gear Hobbers.
1—No. 13 Brown-Sharpe Gear Cutter.
1—96-in. Pratt-Whitney Gear Cutter.
2—24-in. Gleason Gear Planers.
1—36-in. Gleason Gear Planer.
1—18-in. Gleason Gear Planer.
2—No. 12 Barber-Colman Hobbers.
1—No. 4-B Nazel Air Hammer.
1—No. 5-B Nazel Air Hammer.
5—50-lb. Bradley Helve Hammers.
1—300-lb. Bradley Helve Hammer.
1—800 lb. Morgan Steam Hammer.
1—3,500-lb. Niles Steam Drop.
1—No. 1-A Airco Oxagraph Machine.
1—5-ton Wern Rotator.
50—20-in. Cincinnati Rotary Tables.
1—No. 2 BG Garvin Tapper.
1—¾-in. Ajax Steel Bed Upsetter.
1—2½-in. Acme Upsetter.
1—No. 77 Bliss Geared Press.
1—No. 55 DDG Ferracute Press.
1—No. 37½ Bliss Press.
1—No. 562 Niagara Shear.
2—No. 53 Ferracute.
1—No. P-3 Ferracute.
1—No. P-4 Ferracute.
1—No. P-2 Ferracute.

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1—**New Rockford** right angle Hor.
1—**Ridgeway** 84-in. Ver.; 2 hds.

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2—**Baush** No. 3, 21-spindle.
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1—**Moline** No. 5-D, 6-spindle.
1—**Foote-Burt** No. 25.
1—**Nateo** No. 11.
3—**New Garvin** No. 4, 6-spdle.
13—**P. & W.** Nos. 3, 11, 12, 13.

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2—**Colburn** Nos. 2 and 4.
1—**Barnes** 4-spdl. Gang, 20-in.
10—**Barnes** 15-in., 20-in., 22-in.
1—**P. & W.** No. 1 Gun Barrel.
2—**New Turner** No. 3 Vert.
3—**Baker** No. 310.
6—**Cin. Bickford** 24-in.
1—**American** 4-ft. Univ. Radial.
1—**Baush** 6-ft. Radial.
1—**Niles Bement Pond** 96-in. Ridgeway, M. D. Pl. Rad.

MILLING MACHINES
1—**Hendey Norton** No. 2-A Univ.
7—**B. & S.** Nos. 2 and 3-A Univ.
10—**Briggs** "A" and "B" Plain.
2—**Rockford** Nos. 1 and 2.
4—**Cin.** Nos. 2, 3 Univ.
5—**B. & S.** Nos. 2, 2B, 4, 13-B Pl.
1—**Hendey Norton** Nos. 3 Plain.
1—**Kempsmith** No. 3 Plain.
1—**Becker** No. 7 Duplex.
2—**Taylor & Fenn** Vert.
11—**Becker** Nos. 3H, 4B, Ab, 5C C-1 Vert.
9—**P. & W.** 4½x12, 6x14, 6x48, 6x80 Thread.
25—**P. & W.** No. 5 Auto.
30—**P. & W.** 4-in. Spline.

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1—**BULLARD** 61-in. Maxi-Mill; arr. for m.d. less motor.
1—**BRIDGEFORD** 42-in.x38-ft., geared hd., double carriage.

GEAR CUTTERS
5—**Barber Colman** No. 3.
7—**B. & S.** 3x36, 3x26, 4x36.
6—**G. & E.** No. 18-H.
30—**Fellows** Nos. 61, 61, 615.
20—**Gleason** Bevel 6, 11, 18.
3—**Fellows** Gear Grinders.

LATHES
12—**Hendey** 12-in.x5-ft., 14-in.x 6-ft., 16-in.x6-ft.; taper relieving att., draw-in bars.
4—**Seneca Falls** 12-in.x6-ft.QCG.
5—**American** 14x6, 16x8, SPD.
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1—**American** 18-in.x8-ft.
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3—**LeBlond** 26x10 Dup. Crank.
1—**Johnson** 30x12, motor dr.
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2—**Gridley** 4¼-in., 3¼-in. S.S.
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3—**Cleveland** ⅝-in., ⅞-in. B, 1¼-in.
1—**New Britain** 1⅝x7 bar.
9—**New Britain** Nos. 24 and 33.
2—**Natl. Acme** Nos. 52, 54.
13—**P. & S.** Nos. 5-A, 6-A.

PLANERS
1—**Woodward & Powell** 24x24x5.
7—**Putnam** 26x26x8-ft., 2 hds.
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1—**Putnam** 48x48x12-ft., 2 hds.

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3—**Smith & Mills** 16-, 20-, 24-in.
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1—**Columbia** 28-in.
1—**P. & W.** 6-in. Vert.
3—**Dill** 15-18-in. Slotters.

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1—**Acme Fox** Monitor.
1—**W. & S.** No. 6 BG, PF.
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PRESSES
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1—**Landis** 14x48 Crank.
1—**Fitchburg** 12x54.
4—**Cincinnati** No. 2, 12x36.
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2—**Bryant** Nos. 15 dbl. spdl.
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1—**Rivett** No. 205 Radial.
2—**G. & L.** No. 12 Teromatics.
1—**Van Norman** No. 34.

MISCELLANEOUS
1—**Long & Allstatter** No. 3 Punch.
1—**Wickes** single end Punch.
3—**Acme** ½-in., 2-sp. Bolt Cutter.
2—**Landis** 1¼-in. dble. sp.
1—**Natl.** 1½-in., 2-sp. Bolt Cutter.
1—**Geometric** Threading Mach.
LaPointe Broaching Machines (Hudson & New London) Nos. 1, 2, 3, and 4.
1—**Laidlaw Dunn & Gordon** 17x16 Air Compressor, with motor.
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1—**Newton** 42-in. Crankshaft Cold Saw Cutting Off Machine; arr. motor drive.
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1—Warner & Swasey 12-in. Double Head Key Lathe.
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1—Myers 10-in. x 4-ft. Engine Lathe (new).
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30-in.x12-ft. **Lodge & Shipley** Cone and Geared Head.
36-in.x24-ft. **Putnam** Late Type Grd. Hd.

MILLERS

Nos. 2, 3 & 4 **Cincinnati** H. P. Plain.
No. 2½ **LeBlond** Plain.
No. 3 **Kempsmith** Plain.
No. 4B **Brown & Sharpe** Plain.
No. 1 **Kempsmith** Universal.
No. 2 **Hendey** Universal.
No. 3 **Hendey** H. P. Universal.
No. 3 **Cincinnati** Vert.
No. 4 **Cincinnati** Vertical.

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14-in. **Gould & Eberhardt** cone.
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20-in. **American** S.P.D.
20-in. **Stockbridge** cone.
24-in. **Cincinnati** cone.

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1½x9-in. **Acme** Wire feed.
1⅛x18-in. **Pratt & Whitney.**
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MISCELLANEOUS

36 BM. **Gould & Eberhardt** Gear Rougher.
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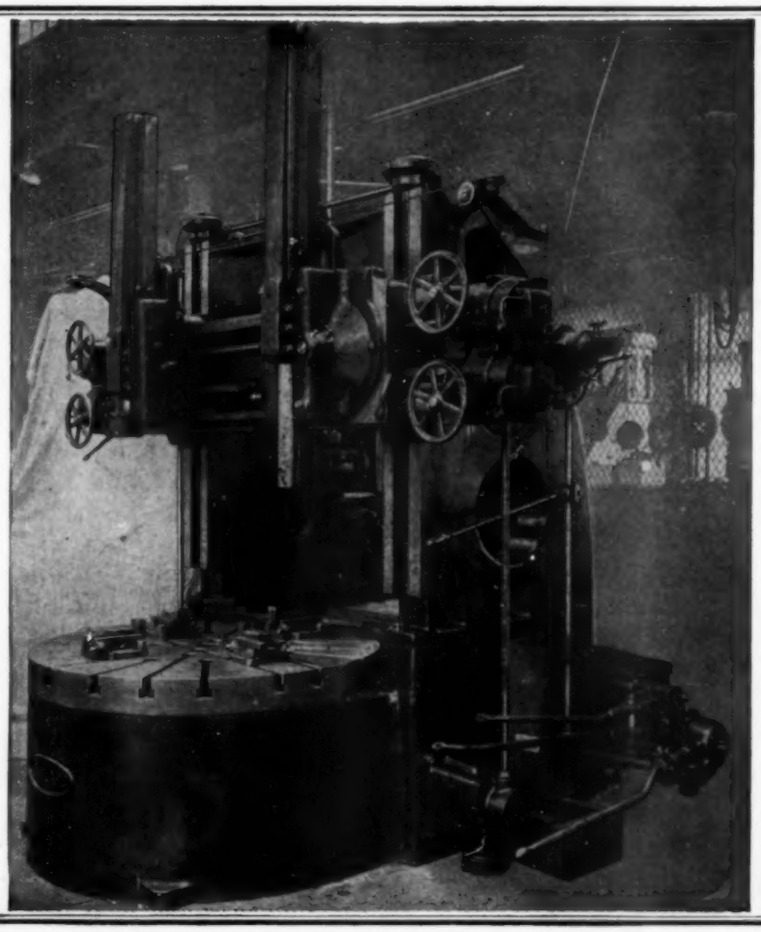

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2½-ft. Carlton ball bearing Sensitive Radial.
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36-in. Cincinnati-Bickford Upright Drill.
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26-in. Reed Prentice Upright Drill, gear box drive.
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24-in. Milwaukee Upright Drill.
22-in. Aurora Upright Drill—tapping attach.
20-in. Barnes All Geared Drill, self oiling.
No. 310 Baker Bros. H. D. Drill.
1—2—3 and 4 Spindle Henry & Wright ball bearing drills.

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42-in.x18-ft. American Tool Works geared head Q. C. Lathe—triple geared.
36-in.x10-ft. Fay & Scott standard change lathe.
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30-in.x17-ft. Houston-Stanwood & Gamble Q. C. Lathe.
24-in.x13-ft. American Tool Works Geared Head Q. C. Lathe.
21-in.x12-ft. R. K. LeBlond Q. C. Lathe.
20-in.x10-ft. American Tool Works geared head Q. C. Lathe—also taper attach.
18-in.x36-in.x9-ft. Fay & Scott sliding bed extension gap Lathe.
18-in.x12-ft. Cisco Q. C. Lathe.
16-in.x8-ft. R. K. LeBlond Q. C. Lathe.
14-in.x6-ft. Hendey yoke head Q. C. Lathe with taper attach.
24-in. Gisholt Turret Lathe, late type.
2-in.x24-in. Jones & Lamson double spindle turret Lathe.
No. 2 and No. 4 Foster Turret Lathes.
No. 4 Brown & Sharpe wire feed screw machine.
No. 2 S. P. Garvin hand screw machine.

SHAPERS AND PLANERS

24-in. Queen City H.D. B.G. Crank Shaper.
24-in. Steptoe Triple Geared Shaper.
20-in. Cincinnati H.D. B.G. Crank Shaper.
16-in. American Tool Works Crank Shaper.
15-in. Hendey Friction Geared Shaper.
26-in.x26-in.x8-ft. Woodward & Powell Planer one (1) head.
36-in.x36-in.x14-ft. American Tool Works Planer two (2) heads.
38-in.x38-in.x18-ft. Niles Planer—two (2) heads.

MILLING MACHINES

No. 1½ Brown & Sharpe Universal Cone Pulley—complete.
No. 1½ Rockford Universal—Cone Pulley complete.
No. 2 Brown & Sharpe Univ. Cone Pulley—complete.
No. 3 and No. 4 Cincinnati Universals Cone Pulley complete.
No. 5 R. K. LeBlond plain—all geared motor drive.
No. 4 Cincinnati High Power Plain Cone Pulley.
No. 3 B—Brown & harpe Plain Single Pulley.
No. 3 B—Brown & Sharpe Plain Single Pulley.
No. 2 R. K. LeBlond Plain Cone Pulley.
No. 1½ Cincinnati Plain Cone Pulley.
No. 3 and No. 6 Becker Vertical Millers.
No. 3 Brown & Sharpe Vertical Single Pulley.
Becker, Large Hand Miller.
No. 7 H Becker Lincoln type Mfg. Miller.

GEAR MACHINERY AND GRINDERS

18 H—Gould & Eberhardt H.D. Gear Hobber.
No. 5 A Lees-Bradner Gear Hobbers.
No. 3—26- and No. 3—36-inch Brown & Sharpe Automatic Gear Cutters (late type).
84-inch Diamond face Grinder—arranged for motor drive.
Walker single stroke surface Grinder—magnetic chuck.
No. 70 and No. 75 Heald Internal Grinders.
No. 60 Heald Cylinder Grinder (late type).
No. 12—26-inch Besley Disc Grinder.
No. 120 Gardner ball bearing double disc Grinder.
No. 2—12-inch x 36-inch Cincinnati Plain Grinder.
8-in.x30-in. Modern plain self contained Grinder.
No. 1 and No. 3 Brown & Sharpe Universal Grinders.
No. 1½ Cincinnati Universal Tool & Cutter Grinder.

MISCELLANEOUS

Beleveney Polishing Machine.
No. 00 Baker Bros. Keyseater cap. up to ⅝-inch.
No. 2 Mitts & Merrill Keyseater.
Lennox Throatless Shear—¾-inch cap.
No. 242—42-inch Niagara Power Shear—cap. 14 ga.
P-No. 4 Ferracute Power Press.
C-No. 3 Ferracute O.B.I. Power Press.
600-lb. Chambersburg Single Frame Steam Hammer.
40-lb. and 60-lb. Bradley Rubber Cushioned Helve Hammers.
No. 2 A H.D. High Speed Rivetting Hammer.
1-inch and 1½-inch Landis Bolt Threading Machines—with lead screws.
1-inch Landis Double Spindle Bolt Threading Machine.
No. 1—No. 2—No. 2X and No. 2 B.G. Garvin Auto Tapping Machines.
10-inch x 10-inch Chicago-Pneumatic Tool Company's, class N.S.B. Belt Driven Air Compressor.

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Fay & Scott Lathe, 14x6, Q.C. gear.

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Hendey No. 3-G.H. Univ. S.P.D. vert. hd.
Hendey No. 2 Universal, div. heads, etc.
Burke No. 4 on stands, auto. feed, (2).
Pratt & Whitney Thread Miller, 4½x12.
11—No. 32 and 33 Kempsmith Lincoln.
1—Becker Vertical, No. AB. S.P. Drive.

MISCELLANEOUS

2—Shapers, 25 in. & 16 in. Smith & Mills.
1—Shaper, 20 in. Ohio B.G., also 16 in.
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Planers, Cincinnati, Whitcomb, 24x8 ft.
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Grinders—No. 11 B. & S. Plain, 6x32 in.
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1—No. 3 W. Miner & Peck 800-lb. Hammer Automatic Lift.
1—No. 5 A. Miner & Peck 300-lb. Hammer Automatic Lift.
1—No. 1 W. Miner & Peck 300-lb. Hammer Automatic Lift.
1—1200-lb. Bliss Board Drop.
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1—5x8-in. McWilliams.

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1—No. 1 Milwaukee Plain Milling Machine.
1—18-in.x10-ft. Seneca Falls Q.C.G., C.B.
1—18-in. Prentice Chucking Lathe.
1—30-in.x16-ft. American Lathe Q.C.G., C.B.
1—3x36-in. Jones & Lamson Turret Lathe both Bar and Chucking Equipment.
10—Bullard Turret Lathes.
12—26-in. Brown Type Spinning Lathes.
2—22-44-in. Pryibil Gap Spinning Lathes.
1—No. 2 Brown & Sharpe Plain Milling Mach.
1—No. 3 Garvin Plain Milling Machine.
1—Gooley & Edlund Milling Machine.

MISCELLANEOUS

1—24x24-in.x6-ft. Gray Planer.
1—28x28-in.x8-ft. New Haven Planer.
1—No. 14 Brown & Sharpe Plain Grinder.
1—Diamond Knife Grinder.
1—Springfield Brandes Vert. Grinder 12x16x84-in.
1—No. 136 Niagara Squaring Shear.
1—No. S-536 Peck Stowe & Wilcox over driven Power Squaring Shear 36 in.
1—50-in. N Streine Tool & Mfg. Co. 14 gauge under driven Squaring Shear.
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1—No. 2 Garvin Horizontal Tapping Machine.
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No. 4 Cincinnati Plain Miller.
No. 3 Kempsmith Plain Miller.
No. 3 Becker Vertical Miller.
No. 2½ LeBlond Plain Miller, cone drive.
No. 2 Kempsmith Plain Miller.
No. 1 Cleveland Plain Miller, S.P.D.
No. 13 Garvin Plain Millers (2).
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MISCELLANEOUS

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No. 11 Brown & Sharpe **Plain Cylindrical Grinder.**
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Lathes, 24 in. x 24 ft., Prentice
Lathe, LeBlond, 13 in. x 5 ft., collet attachment
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Miller, Briggs, type "A"
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Presses, No. 3-A and No. 6-A Willard, O.B.I.
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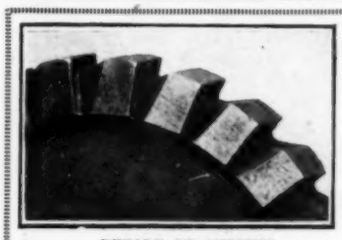

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Hoefer Mfg. Co., Freeport, Ill.
Kingsbury Mfg. Co., Keene, N. H.
Langelier Mfg. Co., Cranston, R. I.
Nat'l Automatic Tool Co., Richmond
Sundstrand Mach. Tool Co., Rockford, Ill.

Drilling Machines, Bench
Ames Co., B. C., Waltham
Barnes Co., W. F. & John, Rockford
Canedy-Otto Mfg. Co., Chicago Hgts.
Clark Electric Co., Jas., Jr., Louisville
Goodell Pratt Co., Greenfield, Mass.
High Speed Hammer Co., Rochester,
Hisey-Wolf Mach. Co., Cincinnati
Langelier Mfg. Co., Cranston, R. I.
Rockford (Ill.) Drilling Mach. Co.
Sloan & Chace, Inc., Newark
Taylor & Fenn Co., Hartford.

Drilling Machines, Gang
Baker Bros., Toledo
Barnes Co., W. F. & John, Rockford
Barnes Drill Co., Rockford
Cincinnati (O.) Bickford Tool Co.
Foote-Burt Co., Cleveland
Hoefer Mfg. Co., Freeport, Ill.
Langelier Mfg. Co., Cranston, R. I.
Rockford (Ill.) Drilling Machine Co.
Taylor & Fenn Co., Hartford

Drilling Machines, Heavy Duty
Baker Bros., Toledo
Barnes Drill Co., Inc., Rockford
Barnes, W. F. & John, Rockford,
Cons. Mach. Tool Corp., Rochester
Foote-Burt Co., Cleveland
Hoefer Mfg. Co., Freeport, Ill.
Rockford (Ill.) Drilling Machine Co.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Baker Bros., Toledo
Barnes Co., W. F. & John, Rockford
Barnes Drill Co., Rockford, Ill.
Boeger-Meyer Mach. & Tool Co., Newark
Cons. Mach. Tool Corp., Rochester
Foote-Burt Co., Cleveland
Fox Mach. Co., Jackson, Mich.
Grant Mfg. & Mch. Co., Bridgeport
Harrington Co., Philadelphia
Kingsbury Mfg. Co., Keene, N. H.
Langelier Mfg. Co., Cranston, R. I.
Moline (Ill.) Tool Co.
Nat'l Automatic Tool Co., Richmond
Pratt & Whitney Co., Hartford, Conn.
Rockford (Ill.) Drilling Mach. Co.

Drilling Machines, Radial
American Tool Wks. Co., Cincinnati
Carlton Mach. Tool Co., Cincinnati
Cincinnati (O.) Bickford Tool Co.
Dreses Mch. T. Co., Cincinnati
Harrington Co., Philadelphia
Morris Machine Tool Co., Cincinnati
Reed-Prentice Corp., Worcester
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia

Drilling Machines, Sensitive
Ames Co., B. C., Waltham
Barnes Co., W. F. & John, Rockford
Canedy-Otto Mfg. Co., Chicago Hgts.
Hardinge Brothers, Inc., Chicago
High Speed Hammer Co., Rochester,
Kingsbury Mfg. Co., Keene, N. H.
Langelier Mfg. Co., Cranston, R. I.
Leland Gifford Co., Worcester
Merit Oil Equip. Co., Cleveland
Taylor & Fenn Co., Hartford
U. S. Mch. Tool Co., Cincinnati
Wisconsin Electric Co., Racine

Drilling Machines, Turret
Hoefer Mfg. Co., Freeport, Ill.
Kingsbury Mfg. Co., Keene, N. H.
Nat'l Automatic Tool Co., Richmond.

Drilling Machines, Vertical
Baker Bros., Toledo
Barnes Co., W. F. & John, Rockford
Barnes Drill Co., Inc., Rockford
Boeger-Meyer Mach. & Tool Co., Newark
Buffalo (N. Y.) Forge Co.
Canedy-Otto Mfg. Co., Chicago Hgts.
Cincinnati (O.) Bickford Tool Co.
Foote-Burt Co., Cleveland
Harrington Co., Philadelphia
Kingsbury Mfg. Co., Keene, N. H.
Knight Mchy. Co., W. B., St. Louis
Langelier Mfg. Co., Cranston, R. I.
Leland-Gifford Co., Worcester
Merit Oil Equip. Co., Cleveland
Rockford (Ill.) Drilling Machine Co.
Ryerson & Son, Jos. T., Chicago
Taylor & Fenn Co., Hartford
U. S. Mch. Tool Co., Cincinnati

Drills, Center
Cleveland (O.) Twist Drill Co.
Merit Oil Equip. Co., Cleveland
Slocomb Co., J. T., Providence
Union Twist Drill Co., Athol, Mass.

Drills, Portable, Electric and Pneumatic
Black & Decker Mfg. Co., Baltimore
Clark Electric Co., Jas., Jr., Louisville
Hisey-Wolf Mach. Co., Cincinnati
Standard Elect. Tool Co., Cincinnati
Wisconsin Electric Co., Racine

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago
Cleveland (O.) Twist Drill Co.
Pratt & Whitney Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

Drills, Twist and Flat
Buckeye Twist Drill Co., Alliance
Cleveland (O.) Twist Drill Co.
Greenfield (Mass.) Tap & Die Corp.
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol, Mass

Electrical Instruments
General Elect. Co., Schenectady

Electrical Supplies
General Elect. Co., Schenectady
Simplex Wire & Cable Co., Boston

Elevating Trucks (See Trucks)

Elevators and Conveyors
Caldwell & Son Co., H. W., Chicago
Link-Belt Co., Chicago

Engineers, Industrial and Mechanical
Hartford (Conn.) Special Mchy. Co.
Underwood Corp., H. B., Philadelphia

Engines, Diesel
Fairbanks Morse & Co., Chicago

Engines, Oil, Gas & Steam
Fairbanks Morse & Co., Chicago

Engraving Machinery
Gorton Mach. Co., Geo., Racine
Keller Mech. Eng. Co., Brooklyn
Preis & Co., H. P., Newark

Expanders, Tube
Watson-Stillman Co., N. Y.

Eyeglass, Safety (See Goggles, Safety)

Facing Machines
Barrett Machine Tool Co., Inc., Meadville, Pa.

Fans, Electric
General Elect. Co., Schenectady

Files and Rasps
Atkins & Co., E. C., Indianapolis
Simonds Saw & Steel Co., Fitchburg.

Filing Machines
Ames Co., B. C., Waltham
Atkins & Co., E. C., Indianapolis
Haskins Co., R. G., Chicago
Illinois Tool Works, Chicago
Oliver Instrument Co., Adrian, Mich.
White Mfg. Co., S. S., N. Y.

Files, Precision
American Swiss File & Tool Co., Elizabeth, N. J.

Filler, Iron (See Cement, Iron)

Fittings, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Flanging Machines, Tube
Grant Mfg. & Mch. Co., Bridgeport

Forging Machinery
Acme Mchy. Co., Cleveland
National Mchy. Co., Tiffin

Foundry Equipment
Atkins & Co., E. C., Indianapolis

Furnaces, Forging
American Gas Furnace Co., Elizabeth

Furnaces, Heat-Treating, Tempering and Annealing
American Gas Furnace Co., Elizabeth
Brown & Sharpe Mfg. Co., Providence
General Elect. Co., Schenectady
Gilbert & Barker Mfg. Co., Springfield, Mass.
Johnson Gas Appliance Co., Cedar Rapids
Strong, Carlisle & Hammond Co., Cleveland

Furniture, Machine Shop
Brown Eng. Co., Reading
New Britain (Conn.) Machine Co.

Gage Blocks
Pratt & Whitney Co., Hartford, Conn.

Gages, Comparator
Federal Products Corp., Providence
Jones & Lamson Mach. Co., Springfield, Vt.

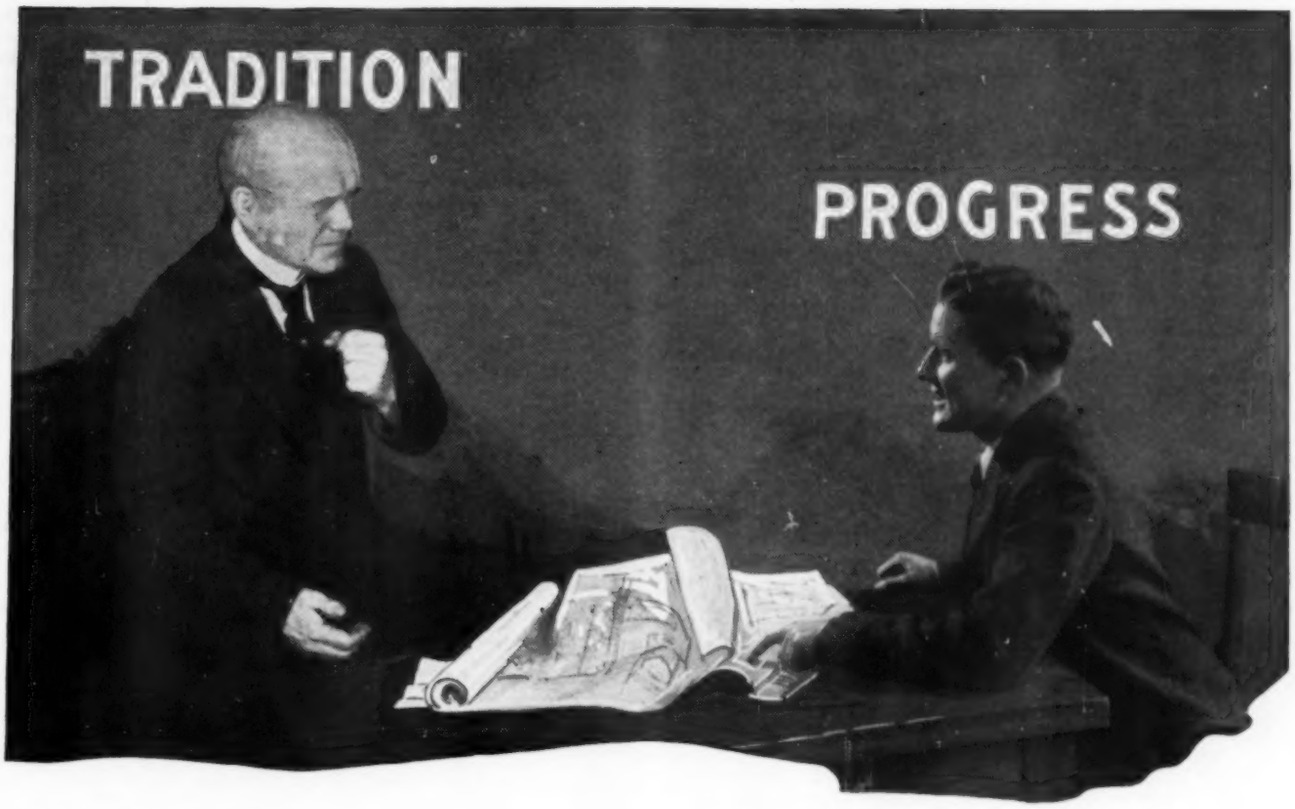
Gages, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence
Comtor Co., The, Waltham
Federal Products Corp., Providence
Starrett Co., L. S., Athol, Mass.

Gages, Plug and Ring
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney Co., Hartford, Conn.

Gages, Recording
Bristol Co., Waterbury
Comtor Co., The, Waltham

Gages, Snap, Thread and Cylindrical
Brown & Sharpe Mfg. Co., Providence
Federal Products Corp., Providence
Greenfield (Mass.) Tap & Die Corp.

Pop tries to disguise an antique



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"Yes, Pop . . .

it's a cinch to have 20 years lifted off your face—but you can't take it off your back. The backbone of our construction is cast iron and it has nothing to commend it but AGE.

The modern trend in production is speed, cutting corners and costs. That's why cast iron is being replaced by Steel Stable arc welded.

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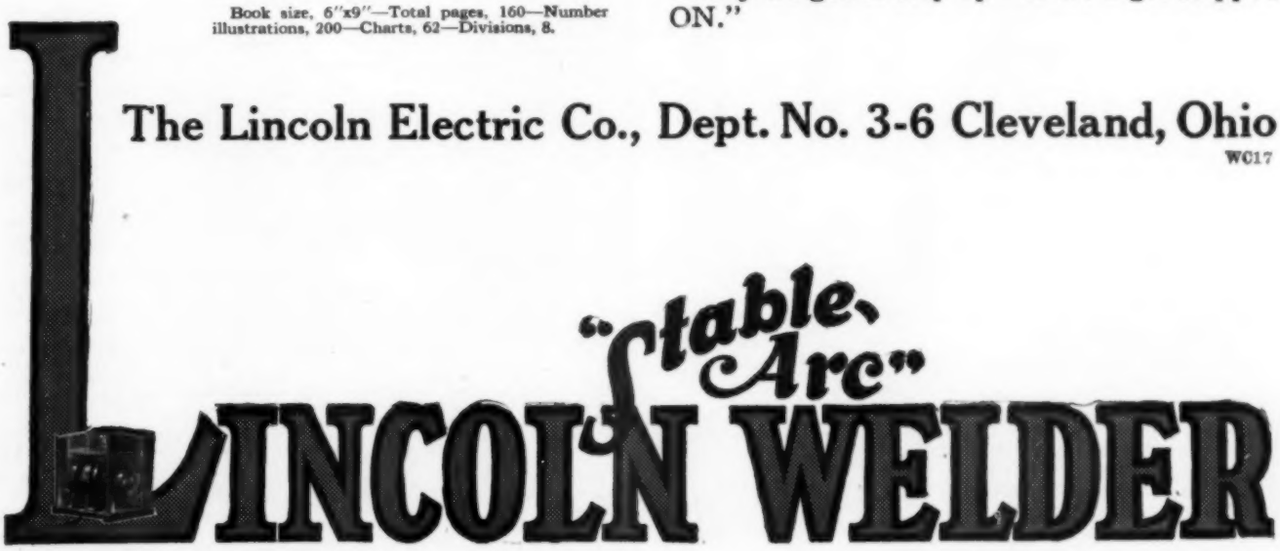

Pratt & Whitney Co., Hartford, Conn.
Slocomb Co., J. T., Providence

Gages, Standard
Brown & Sharpe Mfg. Co., Providence
Federal Products Corp., Providence
Greenfield (Mass.) Tap & Die Corp.
Hartford (Conn.) Special Mchy. Co.
Pratt & Whitney Co., Hartford, Conn.

Gear Blanks Composition
Bakelite Corp., N. Y.

Gear Cutting Machines
Adams Co., Dubuque
Barber-Colman Co., Rockford
Bilgram Mch. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Cutting Mach. Co.
Fellows Gear Shaper Co., Springfield, Vt.
Flather Co., Nashua
Gleason Works, Rochester
Harrington Co., Philadelphia
Lees Bradner Co., Cleveland
Newark (N. J.) Gear Cutting Mch. Co.
Niles Gear Co., N. Y.
Schuchardt & Schutte (Geo. Scherr) N. Y.
Sloan & Chace, Inc., Newark
Wade Tool Co., Waltham
Waltham (Mass.) Mch. Works
Whiton Mch. Co., D. E., New London

Gear Tempering Machinery
Gleason Works, Rochester

Gear Testing Machinery
Adams Co., Dubuque, Iowa
Brown & Sharpe Mfg. Co., Providence
Gleason Works, Rochester
Lees Bradner Co., Cleveland
Newark (N. J.) Gear Cutting Mch. Co.

Gears, Cast
Brown Co., A. & F., Elizabethport
Brown & Sharpe Mfg. Co., Providence
Caldwell & Son, H. W., Chicago
Franklin Die Cast Corp., Syracuse
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Machine Co., W. A., Chicago
Link-Belt Co., Chicago
Niles Kear Co., N. Y.
Pennsylvania Gear & Machine Co., Phila.
Philadelphia (Pa.) Gear Wks.,

Gears, Cut
Adams Co., Dubuque, Iowa
Albaugh-Dover Mfg. Co., Chicago
Bilgram Mch. Wks., Philadelphia
Boston Gear Wks., Norfolk Downs
Brown Co., A. & F., Elizabethport
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Co.
Diefendorf Gear Corp., Syracuse
Earle Gear & Machine Co., Phila.
Fawcus Mch. Co., Pittsburgh
Fellows Gear Shaper Co., Springfield, Vt.
Flather Co., Nashua
Foote Bros. Gear & Mach. Co., Chicago
Franklin Die Casting Corp, Syracuse
Ganschow Co., Wm., Chicago
General Elect. Co., Schenectady
Gleason Works, Rochester
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Machine Co., W. A., Chicago
Link-Belt Co., Chicago
Machine Products Co., Cleveland
Mathews, Hugh, Kansas City
Meisel Press Mfg. Co., Boston
Newark (N. J.) Gear Cutting Mch. Co.
Niles Gear Co., N. Y.
Nuttall Co., R. D., Pittsburgh
Pennsylvania Gear & Machine Co., Phila.
Philadelphia (Pa.) Gear Works
Schuchardt & Schutte (Geo. Scherr Co.), N. Y.
Simonds Mfg. Co., Pittsburgh

Gears, Forged
Grant Gear Wks., Inc., Boston
Niles Gear Co., N. Y.
Philadelphia (Pa.) Gear Works

Gears, Speed Reducing
Albaugh-Dover Mfg. Co., Chicago
Boston Gear Wks. Sales Co., Quincy
Earle Gear & Mach. Co., Phila.
Foote Bros. Gear & Mach. Co., Chicago
Grant Gear Wks., Inc., Boston
Horsburgh & Scott Co., Cleveland
Machine Products Co., Cleveland
Niles Gear Co., N. Y.
Philadelphia (Pa.) Gear Works

Generators, Electric
General Elect. Co., Schenectady
Reliance Elect. & Eng. Co., Cleveland

Grease Cups
Greas-om eter Corp., San Francisco

Grinding Machines, Ball Bearing Race (See Grinding Machines, Radial)

Grinding Machines, Automatic Head and End
Arter Grinding Mach. Co., Worcester

Grinding Machines, Bench
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Clark Electric Co., Jas., Jr., Louisville
Diamond Mch. Co., Providence
Greenfield (Mass.) Tap & Die Corp.
Haskins Co., R. G., Chicago
Norton Co., Worcester
Ryerson & Son, Jos. T., Chicago
Union Twist Drill Co., Athol, Mass.
Walker Co., O. S., Worcester

Grinding Machines, Centerless
Cincinnati (O.) Milling Mach. Co.

Grinding Machines, Chaser
Geometric Tool Co., New Haven

Grinding Machines, Chucking
Blanchard Mch. Co., Cambridge
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester
Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Corp., Boston
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Cutter and Reamer
Barber-Colman Co., Rockford
Barnes Co., W. F. & John, Rockford
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Diamond Mch. Co., Providence
Fafnir Bearing Co., New Britain
Gallmeyer & Livingston Co., Grand Rapids
Greenfield (Mass.) Tap & Die Corp.
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
Norton Co., Worcester
Reed-Prentice Corp., Worcester
Sellers & Co., Wm., Philadelphia
Sterling Grinding Wheel Co., Tiffin
Taylor & Fenn Co., Hartford
Union Twist Drill Co., Athol, Mass.
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Cylindrical
Arter Grinding Mach. Co., Worcester, Mass.
Brown & Sharpe Mfg. Co., Providence
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati (O.) Grinders, Inc.
Cons. Mach. Tool Corp., Rochester
Fitchburg (Mass.) Grinding Mach. Co.
Heald Mach. Co., Worcester
Landis Tool Co., Waynesboro
Norton Co., Worcester
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Die
Abrasive Mch. T. Co., E. Providence
Arter Grinding Mach. Co., Worcester, Mass.
Blanchard Mach. Co., Cambridge
Diamond Mch. Co., Providence
Geometric Tool Co., New Haven
Heald Mch. Co., Worcester
Landis Mach. Co., Waynesboro
Murchey Mach. & T. Co., Detroit
National Mchy. Co., Tiffin
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Disc
Besly & Co., Chas. H., Chicago
Diamond Mch. Co., Providence

Grinding Machines, Drill and Tap
Gallmeyer & Livingston Co., Grand Rapids
LaSalle Tool Co., Ottawa, Ill.
Sellers & Co., Wm., Philadelphia
Wilmarth & Morman Co., Grand Rapids

Grinding Mach. Drill
Sterling Grinding Wheel Co., Tiffin

Grinding Machines, Face or Ring Wheel
Abrasive Mch. T. Co., E. Providence
Besly & Co., Chas. H., Chicago
Blanchard Mach. Co., Cambridge
Diamond Mch. Co., Providence
Gardner Mach. Co., Beloit, Wisc.
Graham Mfg. Co., Providence
Safety Emery Wheel Co., Springfield, O.
Walker Co., O. S., Worcester

Grinding Machines, Floor
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Diamond Mch. Co., Providence
Hisey-Wolf Mach. Co., Cincinnati,
LaSalle Tool Co., Ottawa, Ill.
Norton Co., Worcester
Ryerson & Son, Jos. T., Chicago
Walker Co., O. S., Worcester

Grinding Machines, Gage
Abrasive Mch. T. Co., E. Providence
Landis Tool Co., Waynesboro
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Gears
Lees Bradner Co., Cleveland

Grinding Machines, Hob
Zernickow Co., O. W., N. Y.

Grinding Machines, Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati (O.) Grinders, Inc.
Greenfield (Mass.) Tap & Die Corp.
Heald Machine Co., Worcester
Hjorth Lathe & Tool Co., Boston
Landis Tool Co., Waynesboro
Rivett Lathe & Grinder Corp., Boston
Universal Grinding Mach. Co., Fitchburg, Mass.
Van Norman Mach. Tool Co., Springfield, Mass.
Walker Co., O. S., Worcester

Grinding Machines, Piston Ring
Arter Grinding Mach. Co., Worcester, Mass.
Heald Machine Co., Worcester, Mass.
Safety Emery Wheel Co., Springfield, O.

Grinding Machines, Portable
Armstrong-Blum Mfg. Co., Chicago
Black & Decker Mfg. Co., Baltimore
Clark, Jr., Elec. Co., Jas., Louisville
Haskins Co., R. G., Chicago
Hisey-Wolf Mach. Co., Cincinnati
Standard Elect. Tool Co., Cincinnati
Van Dorn Elec. Tool Co., Cleveland
White Mfg. Co., S. S., N. Y.
Wisconsin Electric Co., Racine

Grinding Machines, Pulley
Graham Mfg. Co., Providence

Grinding Machines, Radial
Van Norman Mach. Tool Co., Springfield, Mass.

Grinding Machines, Snagging
Blount Co., J. G., Everett
Diamond Mch. Co., Providence

Grinding Machines, Surface
Abrasive Mch. T. Co., E. Providence
Arter Grinding Mach. Co., Worcester, Blanchard Mch. Co., Cambridge
Brown & Sharpe Mfg. Co., Providence
Diamond Mch. Co., Providence
Heald Mach. Co., Worcester
LaSalle Tool Co., Ottawa, Ill.
Norton Co., Worcester
Pratt & Whitney Co., Hartford, Conn.
Walker Co., O. S., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Tappet
Fitchburg (Mass.) Grinding Mach. Co.

Grinding Machines Universal
Brown & Sharpe Mfg. Co., Providence
Chicago Pneumatic Tool Co., N. Y.
Cincinnati, (O.) Grinders, Inc.
Gallmeyer & Livingston Co., Grand Rapids
Gisholt Mach. Co., Madison, Wis.
Greenfield (Mass.) Tap & Die Corp.
Landis Tool Co., Waynesboro
Norton Co., Worcester
Wilmarth & Morman Co., Grand Rapids

Grinding Machines, Valve Seat
Fitchburg (Mass.) Grinding Mach. Co.

Grinding Wheels
Atkins & Co., E. C., Indianapolis
Norton Co., Worcester
Sterling Grinding Wheel Co., Tiffin
Vitrified Wheel Co., Westfield

Guards, Lamp
McGill Mfg. Co., Valparaiso

Hammers, Drop
Niles Tool Works Co., N. Y.

Hammers, Power
Bliss Co., E. W., Brooklyn
High Speed Hammer Co., Rochester,
Ryerson & Son, Joseph T., Chicago
Niles Tool Wks., Hamilton

Hammers, Soft Metal
Husky Wrench Co., Milwaukee

Handles, File
Hyro Mfg. Co., New York

Handles, Machine
Rockwood Sprinkler Co., Worcester

Hangers, Shaft
American Pulley Co., Phila.
Brown & Sharpe Mfg. Co., Providence
Fafnir Bearing Co., New Britain
Hyatt Roller Bearing Co., Newark
Jones Fdry. & Machine Co., W. A., Chicago
Standard Pressed Steel Co., Jenkintown

Hardness Measuring Instruments, Steel
Shore Instrument & Mfg. Co., Jamaica, N. Y.

Heaters, Rivet
American Gas Furnace Co., Elizabeth, N. J.

Heat Treating
Wheelock, Lovejoy & Co., Cambridge

Hobbing Machines
Adams Co., Dubuque
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Gear Cutting Mach. Co.
Newark (N. J.) Gear Cutting Mch. Co.
Sommers & Adams Co., Cleveland
Zernickow Co., O. W., N. Y.

Hobs
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Greenfield (Mass.) Tap & Die Corp.
National Tool Co., Cleveland
National Twist D. & T. Co., Detoit
Newark (N. J.) Gear Cutting Mch. Co.
Philadelphia (Pa.) Gear Works
Union Twist Drill Co., Athol, Mass.

Hobs, Milling Cutters
Illinois Tool Wks., Chicago

Hoists & Cranes Electric & Traveling
American Eng. Co., Philadephia
Elwell Parker Electric Co., Cleveland
General Elect. Co., Schenectady
Harrington Co., Philadelphia
Link-Belt Co., Chicago
Shephard Electric Crane & Hoist Co., Montour Falls, N. Y.
Sprague Electric Wks., N. Y.

Hoists, Hand
Chicago Pneumatic Tool Co., N. Y.
Ford Chain Block Co., Phila.
Harrington Co., Philadelphia

Honing Machines
Barnes Drill Co., Rockford, Ill.

Hydraulic Machinery
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Indicators, Speed and Test
Brown & Sharpe Mfg. Co., Providence
Starrett Co, L. S., Athol, Mass.
Veeder Mfg. Co., Hartford
Waterston, J. M., Detroit

Instruments, Optical & Scientific
Comtor Co., The, Waltham

Jacks, Hydraulic
Watson-Stillman Co., N. Y.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago

Jigs and Fixtures (See Contract Work)

Joints, Universal
Boston Gear Works, Norfolk Downs
Fox Mach. Co., Jackson, Mich.
Gray & Prior Mach. Co., Hartford
Nat'l Automatic Tool Co., Richmond

Kettles, Soda
Brown & Sharpe Mfg. Co., Providence
Gray & Prior Mch. Co., Hartford

Keyseating Machines
Baker Bros., Toledo
Davis Keyseater Co., Rochester
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson
Mitts & Merrill, Saginaw

Keys, Machine
Whitney Mfg. Co., Hartford

Lamps, Electric
General Elect. Co., Schenectady

Lapping Machines, Cylindrical and Flat
Bethel-Player Co., Westboro, Mass.
Moline (Ill.) Tool Co.

Lathe Attachments
Ames, B. C. Waltham
Dalton Tool Corp., N. Y.
Flather Co., Nashua
Rivett Lathe & Grinder Corp., Boston

Lathe Tools
Armstrong Bros. Tool Co., Chicago

Lathes, Automatic and Semi-Automatic
Gisholt Mach. Co., Madison, Wis.
Jones & Lamson Mch. Co., Springfield, Vt.
National Acme Co., Windsor, Vt.
Pawtucket (R. I.) Mfg. Co.
Potter & Johnston Mch. Co., Pawtucket.
Pratt & Whitney Co., Hartford, Conn.
Reed-Prentice Corp., Worcester
Seneca Falls Mfg. Co., (N. Y.)
Steinle Turret Mch. Co., Madison, Wis.
Sundstrand Mach. Tool Co., Rockford, Ill.

Lathes, Bench
Ames Co., B. C., Waltham
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Dalton Tool Corp., N. Y.
Diamond Mch. Co., Providence
Hardinge Brothers, Inc., Chicago
Hjorth Lathe & Tool Co., Boston
Pratt & Whitney Co., Hartford, Conn.
Rivett Lathe & Grinder Corp., Boston
Seneca Falls (N. Y.) Machine Co.
Sloan & Chace, Inc., Newark
South Bend (Ind.) Lathe Works
Stark Tool Co., Waltham
Van Norman Mach. Tool Co., Springfield, Mass.
Wade Tool Co., Waltham

Lathes, Boring
Potter & Johnston Mch. Co., Pawtucket
Sundstrand Mach. Tool Co., Rockford, Ill.

Lathes, Chucking (See Lathes, Horizontal and Vertical Turret)

Lathes, Engine
American Tool Wks. Co., Cincinnati
Barnes Co., W. F. & John, Rockford
Blount Co., J. G., Everett
Bradford Mch. Tool Co., Cincinnati
Cons. Mach. Tool Corp., Rochester
Dalton Tool Corp., N. Y.
Flather Co., Nashua
Greaves-Klusman T. Co., Cincinnati
Hendey Mach. Co., Torrington, Conn.
Lodge & Shipley Mch. T. Co., Cincinnati.
Monarch Machine Tool Co., Sidney

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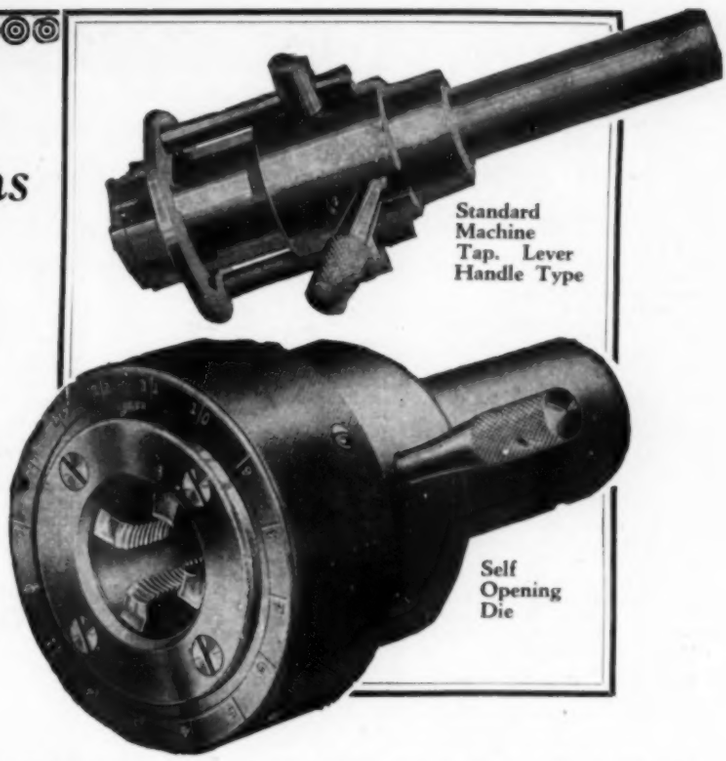
So decisively has this been proved that we will gladly send either a Murchey Self Opening Die or Murchey Collapsible Tap on our 30 day trial offer basis. You be the judge—try the tool on your toughest job—if satisfactory keep it—if not return it to us.

Simply mention the make, size and type of machine you intend to use the tool in when writing.



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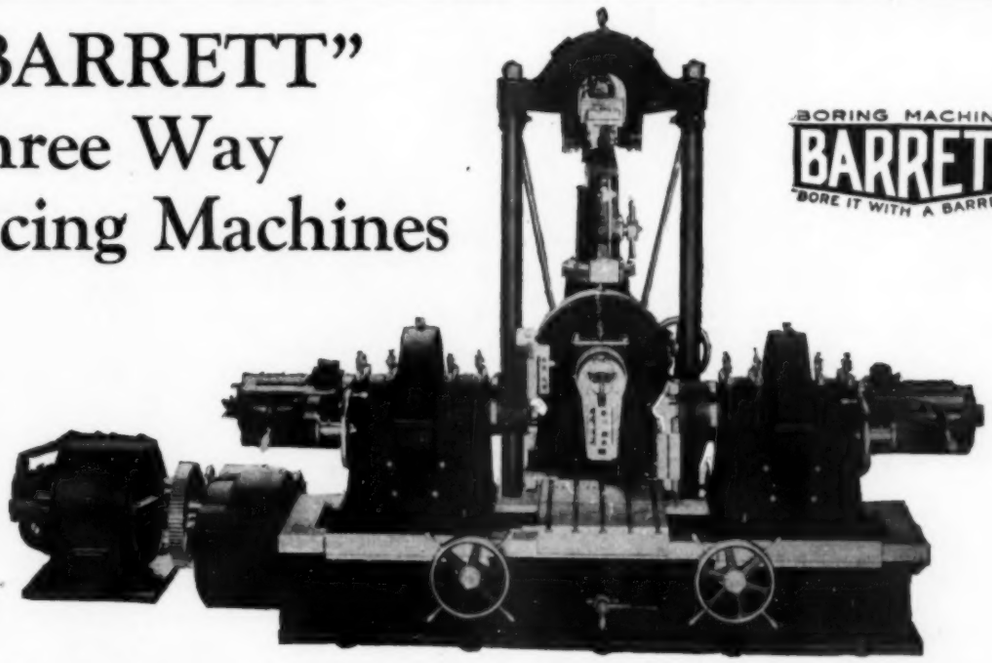
"BARRETT" Three Way Facing Machines

BORING MACHINES
BARRETT
"BORE IT WITH A BARRETT"



Three Way simultaneous facing on Valve Bodies, Flanged Fittings, Tee, Elbows, etc.

Pneumatic Chucking Arrangement with machine provides for quick and accurate chucking.

"Barrett" Three Way Facing Machines are built in two (2)—standard sizes.

"Barrett" **Special** Facing Machines are built in all sizes to meet requirements.

Great production possibilities.

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BARRETT MACHINE TOOL CO., Inc., *Meadville, Penn., U. S. A.*

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South Bend (Ind.) Lathe Works
Springfield (O.) Mach. Tool Co.
Sundstrand Mach. Tool Co., Rockford, Ill.
Warner & Swasey Co., Cleveland
Wickes Bros., Saginaw

Lathes, Extension and Gap
American Tool Wks. Co., Cincinnati
The Harrington Co., Philadelphia
South Bend (Ind.) Lathe Works

Lathes, Foot Power
Barnes Co., W. F. & John, Rockford
Dalton Tool Corp., N. Y.
Seneca Falls (N. Y.) Machine Co.

Lathes, Fox
Bardons & Oliver, Cleveland

Lathes, Horizontal and Vertical Turret
Acme Mach. Tool Co., Cincinnati
Bardons & Oliver, Cleveland
Bullard Mach. Tool Co., Bridgeport
Gisholt Mach. Co., Madison, Wis.
International Mch.T.Co.,Indianapolis
Jones & Lamson Mach. Co., Springfield, Vt.
Niles Tool Works Co., N. Y.
Pratt & Whitney Co., Hartford, Conn.
Steinle Turret Mch. Co., Madison.

Lathes, Polishing (See Polishing and Buffing Machines)

Lathes, Spinning
Adriance Mach. Wks., Brooklyn

Lathes, Toolroom
American Tool Wks. Co., Cincinnati
Hardinge Brothers, Inc., Chicago
Lodge & Shipley Mach. Tool Co., Cincinnati, O.
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

Lathes, Woodturning
Barnes Co., W. F. & John, Rockford
Blount, Co., J. G., Everett
Seneca Falls (N. Y.) Machine Co.

Letters and Figures
Brown & Sharpe Mfg. Co., Providence
Hoggson & Pettis Mfg. Co., New Haven.

Level Precision Machines, Aligning
Pratt & Whitney Co., Hartford, Conn.
Universal Boring Mach. Co., Hudson,

Lighting, Fixtures
General Elect. Co., Schenectady

Lining, Brake & Clutch
Raybestos Co., Bridgeport

Lubricants
Oakite Products, Inc., N. Y.

Lubricating Systems
Grease-om-eter Corp., San Francisco

Machinists' Small Tools
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence
Cutler-Hammer Mfg. Co., Milwaukee
Haynes Stellite Co., Kokomo, Ind.
Prentiss & Co., Henry, N. Y.
Slocomb Co., J. T., Providence
Starrett Co., L. S., Athol, Mass.

Mandrels, Expanding
Brown & Sharpe Mfg. Co., Providence
Logansport (Ind.) Mach. Co.
Nicholson & Co., W. H., Wilkes-Barre

Mandrels, Solid
Brown & Sharpe Mfg. Co., Providence
Cleveland (O.) Twist Drill Co.
Nicholson & Co., W. H., Wilkes-Barre
Pratt & Whitney Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

Mandrels, Solid
Standard Tool Co., Cleveland

Marking Devices (See Stamps, Steel)

Marking Machines
Hjorth Lathe & Tool Co., Boston
Noble & Westbrook Mfg. Co., Hartford

Marking Tools
Schmidt, Inc., Geo. T., Chicago

Measuring Machines
Bethel-Player Co., Westboro, Mass.
Pratt & Whitney Co., Hartford, Conn.

Metal, Monel
International Nickel Co., N. Y.

Meters, Steam Flow
General Elect. Co., Schenectady
Schuchardt & Schutte (Geo. Scherr) N. Y.

Micrometers, Bench
Pratt & Whitney Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.

Micrometer Calipers
Brown & Sharpe Mfg. Co., Providence
Slocomb Co., J. T., Providence
Starrett Co., L. S., Athol, Mass.

Milling Attachments
Adams Co., Dubuque, Ia.
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Hendey Mach. Co., Torrington, Conn.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker, Milwaukee
Niles Tool Works Co., Hamilton
Potter & Johnston Mch. Co., Pawtucket
Reed-Prentice Corp., Worcester
Rockford (Ill.) Milling Mach. Co.
Whitney Mfg. Co., Hartford

Milling Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Ingersoll Mill Mich. Co., Rockford
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

Milling Machines, Bench
Ames Co., B. C., Waltham
Hardinge Brothers, Inc., Chicago
Pratt & Whitney Co., Hartford, Conn.
Sloan & Chace, Inc., Newark, N. J.
Stark Tool Co., Waltham
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Continuous
Cons. Mach. Tool Corp., Rochester
Ingersoll Mill. Mch. Co., Rockford
Potter & Johnston Mch. Co., Pawtucket.
Sundstrand Mach. Tool Co., Rockford, Ill.

Milling Machines, Duplex
Cincinnati (O.) Milling Mach. Co.
Ingersoll Mill. Mch. Co., Rockford
Knight Mchy. Co., W. B., St. Louis
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Hand
Adams & Co., Dubuque, Iowa
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Frew Machine Co., Philadelphia
Pratt & Whitney Co., Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.
U. S. Mch. Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.
Whitney Mfg. Co., Hartford

Milling Machines, Horizontal and Planer Type
Cincinnati (O.) Planer Co.
Cons. Mach. Tool Corp., Rochester
Ingersoll Mill. Mch. Co., Rockford
Niles Tool Works Co., N. Y.

Milling Machines, Plain
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Hendey Mach. Co., Torrington, Conn.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker, Milwaukee
Potter & Johnston Mch. Co. Pawtucket
Ryerson & Son, Joseph T., Chicago
Sundstrand Mach. Tool Co., Rockford, Ill.
U. S. Mch. Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Portable
Ingersoll Mill Mach. Co., Rockford
Underwood Corp., H. B., Phila.

Milling Machines, Thread
Automatic Mach. Co., Bridgeport
Hall Planetary Co., Philadelphia
Harrington Co., Philadelphia
Lees Bradner Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.
Waltham (Mass.) Mch. Works

Milling Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Hendey Mach. Co., Torrington, Conn.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker, Milwaukee
Oesterlein Mach. Co., Cincinnati
Potter & Johnston Mch. Co., Pawtucket
Ryerson & Son, Joseph T. Chicago
Sundstrand Mach. Tool Co., Rockford, Ill.
U. S. Mch. Tool Co., Cincinnati
Van Norman Mach. Tool Co., Springfield, Mass.

Milling Machines, Vertical
Ames Co., B. C., Waltham
Automatic Mach. Co., Bridgeport
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Cons. Mach. Tool Corp., Rochester
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker, Milwaukee
Knight Mchy. Co., W. B., St. Louis
Niles Tool Works Co., N. Y.
Potter & Johnston Mch. Co., Pawtucket
Reed-Prentice Corp., Worcester
Sloan & Chace, Newark, N. J.
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach Tool Co., Springfield, Mass.

Milling Machines, Worm
Pratt & Whitney Co., Hartford, Conn.
Waltham (Mass.) Mch. Works
Zernickow Co., O. W., N. Y.

Milling Tools, Adjustable Hollow
Geometric Tool Co., New Haven

Motors, Electric
Burke Electric Co., Erie
General Elect. Co., Schenectady
Lincoln Electric Co., Cleveland
Ohio Electric & Controller Co., Cleveland
Reliance Elec. & Eng. Co., Cleveland
Wisconsin Electric Co., Racine

Name Plates
Schwerdtle Stamp Co., Bridgeport
Westinghouse Elect. & Mfg. Co., Pittsburgh, Pa.

Nickel
International Nickel Co., N. Y.

Numbering Machines
Noble & Westbrook Mfg. Co., Hartford

Nut Tappers (See Bolt and Nut Machinery

Nuts, Lock (See Lock-Nuts)

Oil and Grease Cups
Bay State Stamping Co., Wocester
Gits Bros. Mfg. Co., Chicago
Tucker, W. A. & C. F., Hartford

Oil Grooving Machines
Hanson-Whitney Mach. Co., Hartford

Oil Stones
Norton Co., Worcester

Oil Storage Equipment
Gilbert & Barker Mfg. Co., Springfield, Mass.

Oils (See Lubricants)

Painting Equipment
Ingersoll-Rand Co., N. Y.

Parallels
Starrett Co., L. S., Athol, Mass.

Pattern Shop Machinery (See Woodworking Machinery)

Patterns, Wood and Metal
Mehl Mch. T. & Die Co., Roselle,

Pins, Leader
Danly Machine Specialties, Inc. Chicago

Pipe Bending Machines
Harrington Co., Philadelphia
Underwood Corp., H. B., Phila.

Pipe, Brass
Bridgeport (Conn.) Brass Co.

Pipe Cutting and Threading Machines
Greenfield (Mass.) Tap & Die Corp.
Harrington Co., Philadelphia
Niles Tool Works Co., N. Y.
Ryerson & Son., Jos. T., Chicago
Saunders Sons, D., Yonkers

Pipe Facing Machines
Barrett Machine Tool Co., Inc., Meadville, Pa.

Pipe Fitters Tools
Cleveland (O.) Twist Drill Co.
Greenfield (Mass.) Tap & Die Corp.

Planer Machine Knives
Atkins & Co., E. C., Indianapolis

Planing Machines
American Tool Wks. Co., Cincinnati
Automatic Mch. Co., Bridgeport
Cincinnati (O.) Planer Co.
Cleveland (O.) Planer Co.
Cons. Mach. Tool Corp., Rochester
Gray Co., G. A., Cincinnati
Niles Tool Works Co., N. Y.
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia

Planing Machines, Rotary
Underwood Corp., H. B., Phila.

Pneumatic Tools
Anderson Bros. Mfg. Co., Rockford
Chicago Pneumatic Tool Co., N. Y.

Polishing and Buffing Machines
Barnes Co., W. F. & John, Rockford
Blanchard Mch. Co., Cambridge
Blount Co., J. G., Everett
Brown & Sharpe Mfg. Co., Providence
Bryant Chucking Grinder Co., Springfield, Vt.
Diamond Mch. Co., Providence
Greenfield (Mass.) Tap & Die Corp.
Heald Mch. Co., Worcester
Landis Tool Co., Waynesboro
New Britain (Conn.) Machine Co.
Rowbottom Machine Co., Waterbury
Standard Elect. Tool Co., Cincinnati
Union Twist Drill Co., Athol, Mass.
Van Dorn Elect. Tool Co., Cleveland
Van Norman Mach. Tool Co., Springfield, Mass
Wisconsin Electric Co., Racine

Press Accessories, Punch
Danly Machine Specialties, Inc., Chicago

Pressed Steel Parts
Standard Pressed Steel Co., Jenkintown

Press Feeds
Littell Mach. Co., F. J., Chicago

Presses, Arbor
Barnes Co., W. F. & John, Rockford
Crane Puller Co., So. Deerfield
Logansport (Ind.) Machine Co., The
Nicholson & Co., W. H., Wilkes-Barre

Presses, Drop and Forging
Bliss Co., E. W., Brooklyn
Niagara Machine & Tool Wks., Buffalo
Toledo (O.) Mch. & Tool Co.

Presses, Foot and Hand
Adriance Mach. Wks., Brooklyn
Bliss Co., E. W., Brooklyn
Niagara Mach. & Tool Wks., Buffalo
Shuster Co., F. B., New Haven
Taylor & Fenn Co., Hartford

Presses, Forcing
Barnes Co., W. F. & John, Rockford
Elmes Eng. Wks., Chas. F., Chicago
Lucas Machine Tool Co., Cleveland

Presses, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Oilgear Co., The, Milwaukee
Watson-Stillman Co., N. Y.

Presses, Power
Adriance Mch. Wks., Brooklyn
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn
Federal Press Co., Elkhart
Fox Mach. Co., Jackson, Mich.
Niagara Mach. & Tool Wks., Buffalo
Rowbottom Machine Co., Waterbury
Toledo (O.) Mch. & Tool Co.

Presses, Screw
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn

Profiling Machines
Automatic Mch. Co., Bridgeport
Frew Machine Co., Philadelphia
Pratt & Whitney Co., Hartford, Conn.
Stark Tool Co., Waltham

Pullers, Wheel
Crane Puller Co., So. Deerfield

Pulleys, Metal
American Pulley Co., Philadelphia
Brown Co., A. & F., Elizabethport
Brown & Sharpe Mfg. Co., Providence
Caldwell & Son Co., H. W., Chicago
Johnson Mach. Co., Carlyle, Manchester, Conn.
Jones Fdry. & Machine Co., W. A. Chicago
Pyott Foundry Co., Chicago

Pumps, Hydraulic
Elmes Eng. Wks., Chas. F. Chicago
Oilgear Co., The, Milwaukee

Pumps, Lubricant and Oil
Brown & Sharpe Mfg. Co., Providence

Punches, Center
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Armstrong-Blum Mfg. Co., Chicago
Hilo Varnish Corp., Brooklyn

Punches, Metal
Hyro Mfg. Co., New York

Punches, Power
Buffalo (N. Y.) Forge Co.
Fairbanks Morse & Co., Chicago
Mitts & Merrill, Saginaw
Niagara Mch. & T. Wks., Buffalo
Ryerson & Son, Joseph T., Chicago
Watson-Stillman Co., N. Y.

Punching and Shearing Machines
Cons. Mach. Tool Corp., Rochester
Wickes Bros., Saginaw, Mich.

Pyrometers, Electric
Bristol Co., Waterbury

Rack Cutting Machines See (Gear Cutting Mach.)

Racks, Cut
Boston Gear Wks., Quincy, Mass.
Foote Bros. Gear & Mach. Co., Chicago
Grant Gear Wks., Inc., Boston
Meisel Press Mfg. Co., Boston
Niles Gear Co., N. Y.

Racks, Storage (See Furniture, Machine Shop)

Rammers, Foundry
Brown & Sharpe Mfg. Co., Providence
Chicago Pneumatic Tool Co., N. Y.

Reamer Holders
Landis Mach. Co., Waynesboro
McCrosky Tool Corp., Meadville, Pa.
Nicholson & Co., W. H., Wilkes-Barre

Reamers, Adjustable
Brubaker & Bros. Co., W. L., N. Y.
Cleveland (O.) Twist Drill Co.
Gammonds Holman Co., Manchester,
Gisholt Mach. Co., Madison, Wis.
Greenfield (Mass.) Tap & Die Corp.
McCrosky Tool Corp., Meadville, Pa.
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford, Conn.

Reamers, Solid
Bilton Machine Tool Co., Bridgeport
Brubaker & Bros. Co., W. L., N. Y.
Buckeye Twist Drill Co., Alliance
Cleveland (O.) Twist Drill Co.
Gammons-Holman Co., Manchester,
Greenfield (Mass.) Tap & Die Corp.
Hjorth Lathe & Tool Co., Boston
National Tool Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.
Reed Mfg. Co., Erie
Union Twist Drill Co., Athol, Mass.

Reamers, Taper
Bilton Machine Tool Co., Bridgeport
Brown & Sharpe Mfg. Co., Providence
Gammons-Holman Co., Manchester, Conn.
Greenfield (Mass.) Tap & Die Corp.
Pratt & Whitney Co., Hartford, Conn.
Threadwell Tool Co., Greenfield,
Union Twist Drill Co., Athol, Mass.

Reaming Machines
The Blanchard Mach. Co., Cambridge

Recorders, Pressure
Bristol Co., Waterbury

Recorders, Temperature
Bristol Co., Waterbury

For the Sake of Accuracy

To correct any possible inaccuracies in spur gears caused during cutting or by warpage during heat treatment the Nuttall Company has complete facilities for grinding gear teeth to the correct involute tooth form. In the grinding operation tolerances of two one thousandths of an inch are maintained, giving a tooth of great accuracy and of fine finish. Ground tooth gears operate quietly and smoothly, and are indispensable in installations where noise and vibration are objectionable. Our facilities for grinding gear teeth are very complete; we are able to handle economically a large range of sizes, and if you need quiet running hardened gears it will pay you to investigate.

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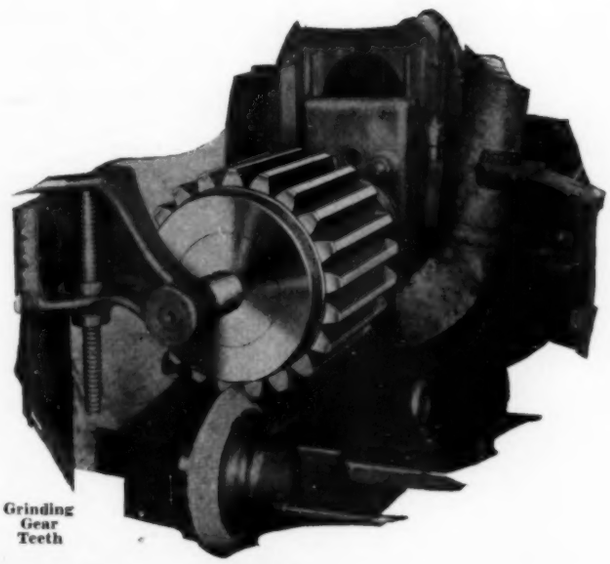
Lyman Tube & Supply Co., Montreal, Canada



Grinding Gear Teeth

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General Elect. Co., Schenectady
Riveters
High Speed Hammer Co., Rochester,
Rivet Sets
Chicago Pneumatic Tool Co., N. Y.
Hunter Saw & Mch. Co., Pittsburgh
Rivet Making Machinery
National Machinery Co., Tiffin
Riveting Machines
Chicago Pneumatic Tool Co., N. Y.
Grant Mfg. & Machine Co., Bridgeport
High Speed Hammer Co., Rochester,
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Shuster Co., F. B., New Haven
Rod Cutters
Tucker, W. A. & C. F., Hartford
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Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.
Rust Preventives
Oakite Products, Inc., N. Y.
Sand Rammers, Pneumatic
Chicago Pneumatic Tool Co., N. Y.
Saw Frames and Blades
American Saw & Mfg. Co.,Springfield
Atkins & Co., E. C., Indianapolis
Starrett Co., L. S., Athol, Mass.
Simonds Saw & Steel Co., Fitchburg,
Thompson & Son Co., Henry G., New Haven, Conn.
Saw Sharpening Machines
Hunter Saw & Mch. Co., Pittsburgh
Simonds Saw & Steel Co., Fitchburg,
Sawing Machines, Metal
Armstrong-Blum Mfg. Co., Chicago
Atkins & Co., E. C., Indianapolis
Earle Gear & Mach. Co., Phila.
Greenfield (Mass.) Tap & Die Corp.
Peerless Machine Co., Racine
Thompson & Son Co., Henry G., New Haven, Conn.
Sawing Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Avey Drilling Mach. Co., Cincinnati
Celeron Co., Bridgeport
Peerless Machine Co., Racine
Saws, Band
Atkins & Co., E. C., Indianapolis
Simonds Saw & Steel Co., Fitchburg, Mass.
Thompson & Son Co., Henry G. New Haven, Conn.
Saws, Circular, Metal Cutting
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford
Hunter Saw & Mach. Co., Pittsburgh
Simonds Saw & Steel Co., Fitchburg,
Union Twist Drill Co., Athol, Mass.
Saws, Circular Wood
Atkins & Co., E. C., Indianapolis
Simonds Saw & Steel Co., Fitchburg,
Saws, Hand and Cross Cut
Atkins & Co., E. C., Indianapolis
Simonds Saw & Steel Co., Fitchburg,
Saws, Inserted Tooth
Atkins & Co., E. C., Indianapolis
Simonds Saw & Steel Co., Fitchburg,
Saws, Metal Cutting
American Saw & Mfg. Co.,Springfield
Avey Drilling Mach. Co., Cincinnati
Saws, Milling
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
National Tool Co., Cleveland
National Twist D. & T. Co., Detroit
Simonds Saw & Steel Co., Fitchburg,
Saws, Screw Slotting
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Simonds Saw & Steel Co., Fitchburg,
Union Twist Drill Co., Athol, Mass.
Scales
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.
Scraping Machs., Metal
Anderson Bros. Mfg. Co., Rockford
Screw-Machine Work
Eastern Mch. Screw Corp., New Haven
Froiland Chain & Mfg. Co., Springfield, Mass.
Liberty Tool & Gage Works, Woonsocket, R. I.
Morris Machine Tool Co., Cincinnati
National Acme Co., Cleveland
New Britain (Conn.) Machine Co.
Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cone Auto. Mch. Co., Windsor, Vt.
National Acme Co., Cleveland
New Britain (Conn.) Machine Co.
Screw Machines, Plain or Hand
Acme Mch. Tool Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence
Dreses Mch. Tool Co., Cincinnati
Gisholt Machine Co., Madison, Wis.
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mch. Co., Springfield, Vt
Pratt & Whitney Co., Hartford, Conn.
Screw Plates
Brubaker & Bros. Co., W. L., N. Y.
Card Mfg. Co., S. W., Mansfield,
Carpenter Tap & Die Co., J. M., Pawtucket
Greenfield (Mass.) Tap & Die Corp.
Pratt & Whitney Co., Hartford, Conn.
Threadwell Tool Co., Greenfield,
Screws, Cap and Set
Allen Mfg. Co., Hartford
Bristol Co., Waterbury
Eastern Mch. Screw Corp., New Haven
National Acme Co., Cleveland
Standard Pressed Steel Co., Jenkintown
Strong, Carlisle & Hammond Co., Cleveland, O.
Screws, Machine
Allen Mfg. Co., Hartford
Bristol Co., Waterbury
Eastern Mach. Screw Corp., New Haven
Screws, Safety Set (see Screws, Cap and Set)
Seamless Steel Tubing (See Tubing, Seamless Steel
Second-Hand Machinery (See Searchlight Section)
H. F. Allen Co., Inc., N. Y.
Beal & Co., Jas., Boston
Botwinik Bros., Inc., New Haven
Brownell Mchy. Co., Providence
Delta Equipment Co., Philadelphia.
Eastern Machinery Co., Cincinnati
Eddy Machy. Co., E. A., Providence
Emerman & Co., Louis E., Chicago
Essley Mchy. Co., E. L., Chicago
Failor Co., Inc., N. C., N. Y.
Hill Clark & Co., Chicago
Hyman & Sons, Jos., Philadelphia
Lamberg & Co., A., N. Y.
Lucas & Son, Inc., J. L., Bridgeport
Lynd Farquhar Co., Boston
Northern Tool & Disc Co., Detroit
Norton-Broadway Mchy. Co., Cincinnati
Osborne & Sexton Mchy. Co., Columbus
Prentiss & Co., Henry, N. Y.
Sandusky (O.) Supply Co., Inc.
Simmons Mach. Tool Corp., Albany
Smith Machinery Co., H. A., Syracuse
Wayne Mchy. Co., Ft. Wayne
Wickes Mchy. Co., Jersey City
Shafting
Hawkridge Bros., Boston
Strand & Co., N. A., Chicago
Union Drawn Steel Co., Beaver Falls
Shafts, Flexible
Haskins Co., N. A., Chicago
Strand & Co., N. A., Chicago
White Mfg. Co., S. S., N. Y.
Shapers, Machine
American Tool Wks. Co., Cincinnati
Automatic Mach. Co., Bridgeport
Gould & Eberhardt, Newark
Hendey Mach. Co., Torrington, Conn.
Kelly Co., R. A., Xenia, Ohio
Niles Tool Works Co., N. Y.
Potter & Johnston Mch. Co., Pawtucket.
Reed-Prentice Corp., Worcester
Smith & Mills Co., Cincinnati
Springfield (O.) Mach. Tool Co.
Steel Products Eng. Co., Springfield, O.
Shapes, Cold Drawn Spinal Steel
Union Drawn Steel Co., Beaver Falls
Shear Blades
Simonds Saw & Steel Co., Fitchburg,
Shears, Hand
Armstrong-Blum Mfg. Co., Chicago
Tucker, W. A. & C. F., Hartford
Shears, Power
Adriance Mach. Wks., Brooklyn
Buffalo (N. Y.) Forge Co.
Landis Mch. Co., Waynesboro.
Mitts & Merrill, Saginaw
Murchey Mach. & Tool Co., Detroit
Niagara Mch. & T. Wks., Buffalo
Ryerson & Son, Jos. T., Chicago
Toledo (O.) Mch. & Tool Co.
Sheet Metal Working Machinery
Adriance Mach. Wks., Brooklyn
Bliss Co., E. W., Brooklyn
Cincinnati (O.) Gear Cutting Mach. Co.
Niagara Machine & Tool Wks., Buffalo, N. Y.
Ryerson & Son, Jos. T., Chicago
Toledo (O.) Mch. & Tool Co.
Sleeves, Taper
Schuchardt & Schutte (Geo. Scherr) N. Y.
Slotting Machines
Cons. Mach. Tool Corp., Rochester
Niles Tool Works Co., N. Y.
Sellers & Co., Wm., Philadelphia
Speed Reducers
Albaugh-Dover Mfg. Co., Chicago
Boston Gear Wks., Norfolk Downs
Foote Bros. Gear & Mach. Co., Chicago
Grant Gear Wks., Inc., Boston
Jones Fdry. & Machine Co., W. A., Chicago
Philadelphia (Pa.) Gear Works
Shephard Electric Crane & Hoist Co., Montour Falls, N. Y.
Spindles
Ex-Cell-O Tool & Mfg. Co., Detroit
Standard Tool Co., Cleveland
Spring Winders
Hjorth Lathe & Tool Co., Boston
Springs
Fischer Spring Co., Chas., Brooklyn
Sprockets and Chains
Bilgram Mch. Wks. Sales Co., Philadelphia
Boston Gear Wks. Sales Co., Norfolk Downs
Cullman Wheel Co., Chicago.
Grant Gear Wks., Boston.
Jones Fdry. & Machine Co., W. A., Chicago
Link-Belt Co., Chicago
Morse Chain Co., Ithaca, N. Y.
Philadelphia (Pa.) Gear Works
Whitney Mfg. Co., Hartford
Squares
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.
Stampings, Metal
American Pulley Co., Philadelphia
Bay State Stamping Co., Worcester
Detroit (Mich.) Stamping Co.
Liberty Tool & Gage Works, Woonsocket, R. I.
Rockwood Sprinkler Co., Worcester
Stamps, Steel
Hoggson & Peters Mfg. Co., New Haven
Noble & Westbrook Mfg. Co., Hartford
Schmidt, Inc., Geo. T., Chicago
Schwerdtle Stamp Co., Bridgeport
Stands, Portable (See Furniture, Machine Shop)
Steel, Cold Drawn
Union Drawn Steel Co., Beaver Falls
Steel, Cold Rolled Strip
Carpenter Steel Co., Reading
Hawkridge Bros. Co., Boston
Union Drawn Steel Co., Beaver Falls
Steel Crucible
Carpenter Steel Co., Reading
Columbia Tool Steel Co., Chicago Heights
Simonds Saw & Steel Co., Fitchburg,
Steel, Rustless and Stainless
Carpenter Steel Co., Reading
Firth-Sterling Steel Co., McKeesport
Steel, Sheet
Hawkridge Bros. Co., Boston
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Our Contribution to Captain LINDBERGH

WESTERN UNION

Form 126-S

SYMBOLS

DL	Day Letter
NM	Night Message
NL	Night Letter
LCO	Deferred
CLT	Cable Letter
WLT	Week End Letter

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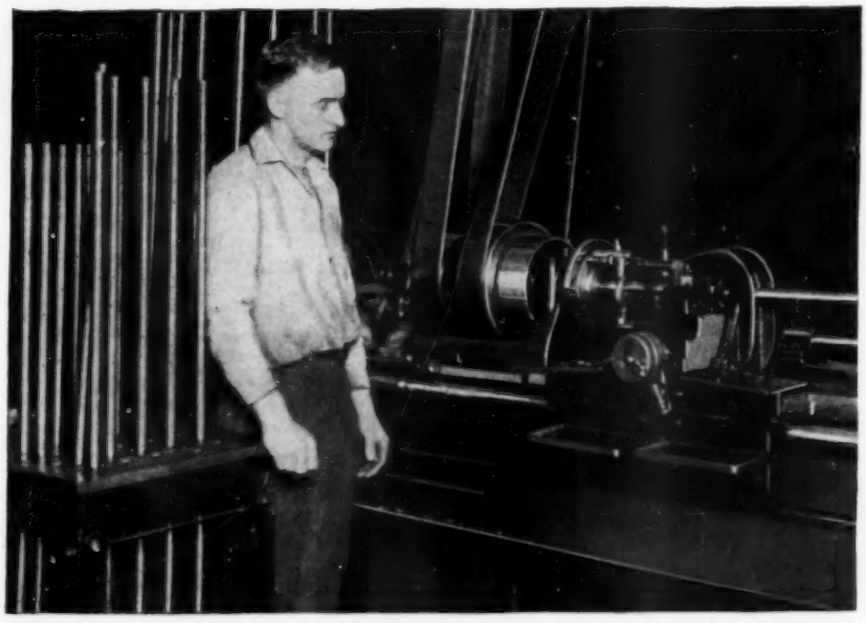

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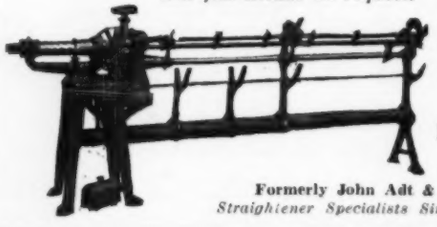

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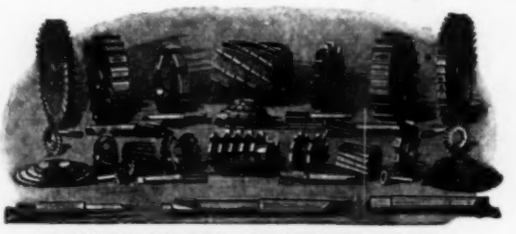

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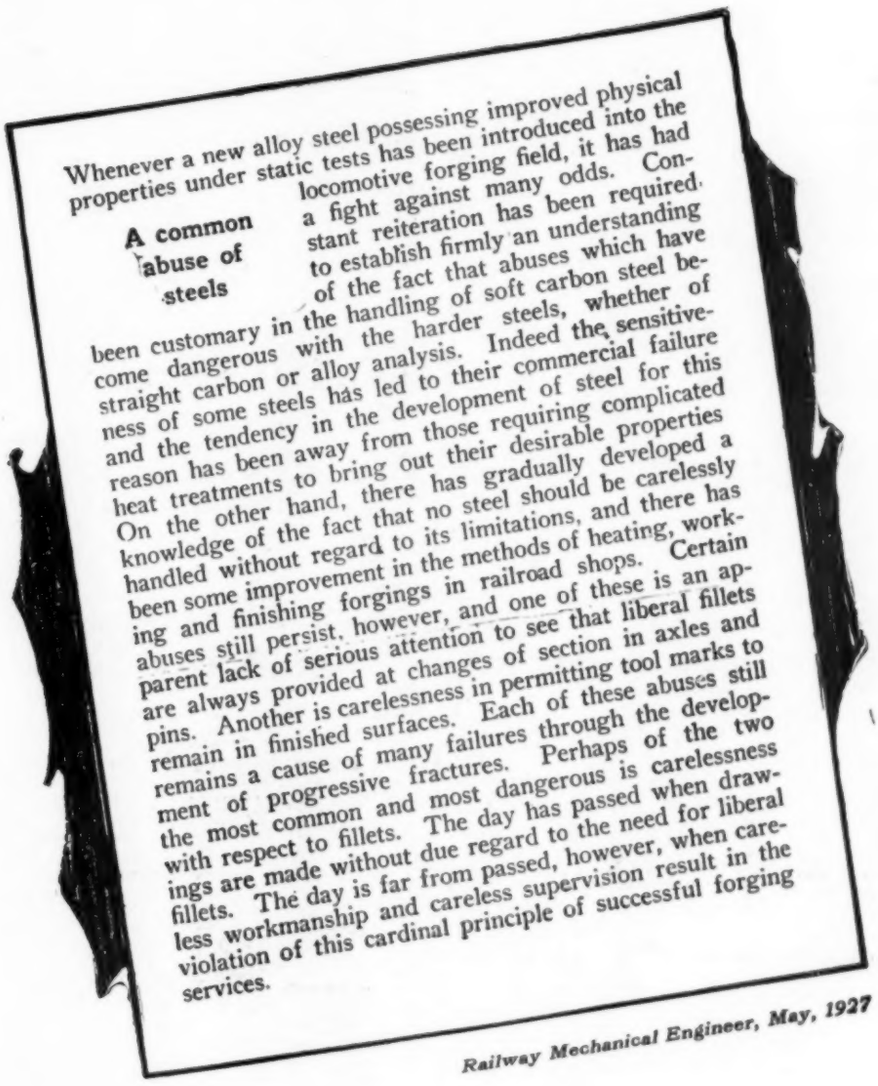
A Common Abuse Of Steels



A common abuse of steels

Whenever a new alloy steel possessing improved physical properties under static tests has been introduced into the locomotive forging field, it has had a fight against many odds. Constant reiteration has been required to establish firmly an understanding of the fact that abuses which have been customary in the handling of soft carbon steel become dangerous with the harder steels, whether of straight carbon or alloy analysis. Indeed the sensitiveness of some steels has led to their commercial failure and the tendency in the development of steel for this reason has been away from those requiring complicated heat treatments to bring out their desirable properties On the other hand, there has gradually developed a knowledge of the fact that no steel should be carelessly handled without regard to its limitations, and there has been some improvement in the methods of heating, working and finishing forgings in railroad shops. Certain abuses still persist, however, and one of these is an apparent lack of serious attention to see that liberal fillets are always provided at changes of section in axles and pins. Another is carelessness in permitting tool marks to remain in finished surfaces. Each of these abuses still remains a cause of many failures through the development of progressive fractures. Perhaps of the two the most common and most dangerous is carelessness with respect to fillets. The day has passed when drawings are made without due regard to the need for liberal fillets. The day is far from passed, however, when careless workmanship and careless supervision result in the violation of this cardinal principle of successful forging services.

Railway Mechanical Engineer, May, 1927

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Torrington Co	88
Traylor Engrg. Co	97
Tucker, W. A. & C. T	60
Underwood Corp., H. B	89
Union Drawn Steel Co	46
Union Electric Mfg. Co	72
Union Mfg. Co	85
Union Twist Drill Co	27
United States Machine Tool Co	73
Universal Boring Mach. Co	77
Universal Machine Co	107
U. S. Drill Head Co	77
U. S. Tool Co	82, 106
V. & O Press Co	80
Vanadium Alloys Steel Co	66
Vanadium Corp. of America	119
Van Norman Machine Tool Co	73
Veeder Mfg. Co	85
Vitrified Wheel Co	74
Vulcan Crucible Steel Co	66
Wade Tool Co	80
Wahlstrom Tool Co	84
Walker, Inc., O. S	83
Waltham Machine Works	81
Walton Co	91
Waterson, J. M	85
Watson Stillman Co	87
Wayne Machinery Co	102
Weldit Acetylene Co	68
Wheel Trueing Tool Co	7
White Dental Co., S. S	94
Whitney Mfg. Co	53
Whiton Machine Co., D. E	83
Wicks Bros	80
Wickes Machinery Co	103, 104
Wilcox, Crittenden & Co	107
Wilmarth & Morman Co	75
Wilson Welder & Metals Co	67
Wisconsin Electric Co	72
Zernickow, O	65